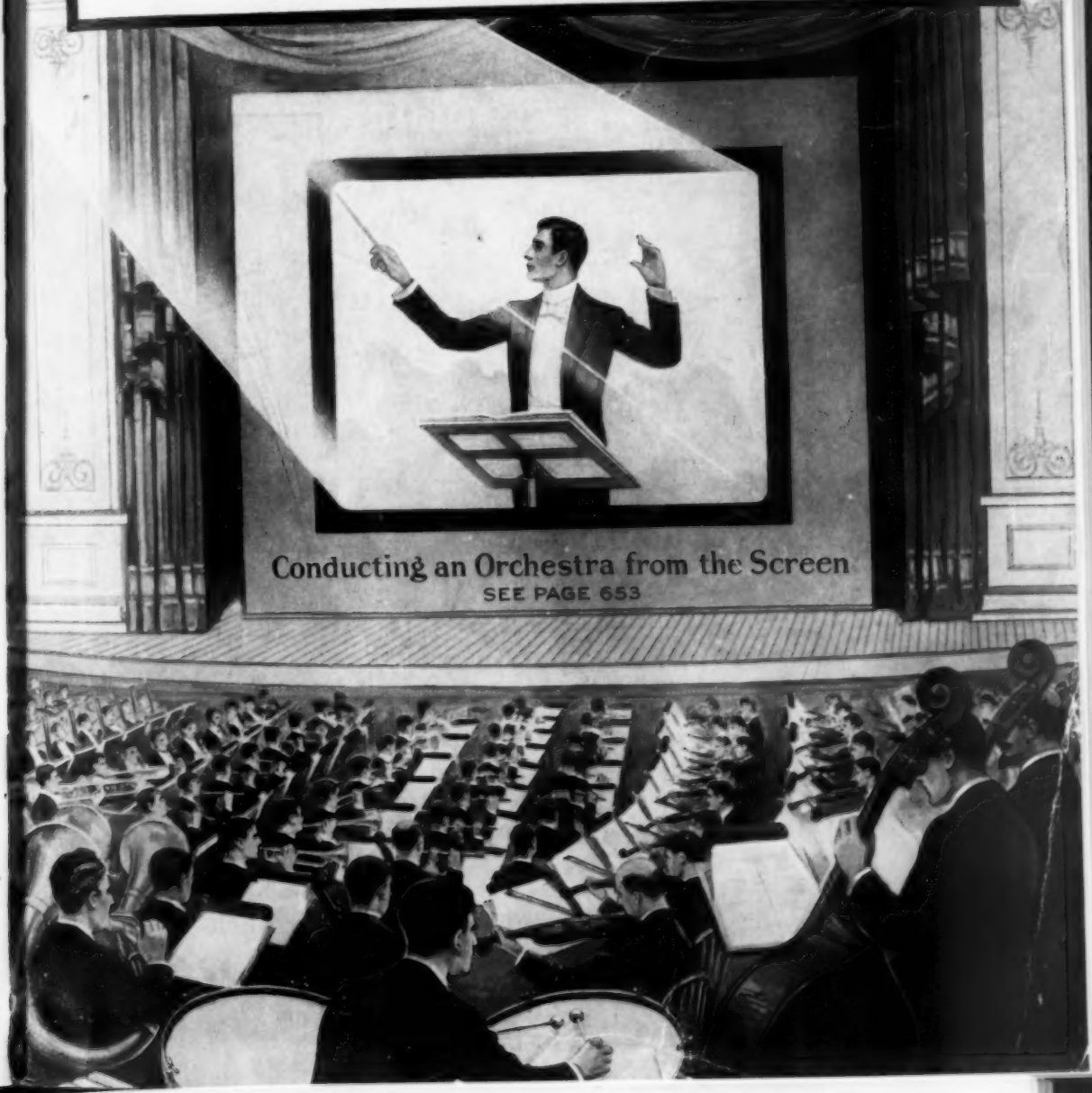
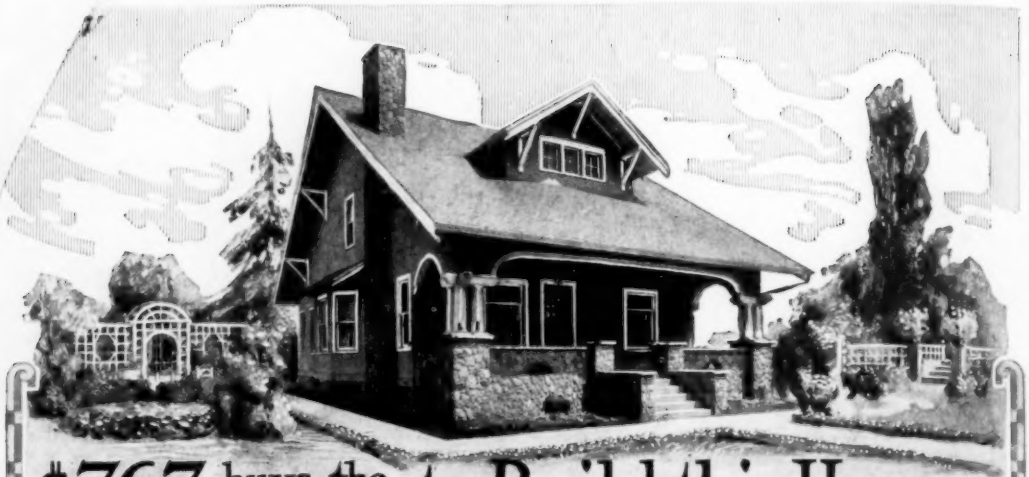
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



Conducting an Orchestra from the Screen

SEE PAGE 653



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Vol. 26 NOVEMBER, 1916 No. 5

Motorcycle Ambulance Carries Two Stretchers

TWO wounded soldiers can be carried at high speed by a new motorcycle ambulance that has recently been developed by an eastern manufacturer. The apparatus is of the double-decked type with regulation stretchers held one above the other in a steel frame on the side-car chassis. The tread of the machine is adjustable and thus may be regulated to suit different road conditions. Attached to the chassis below the lower stretcher is a small cabinet in which first-aid supplies are stored. The stretchers can be fitted in place or removed quickly without disturbing their occupants. Motorcycle ambulances have

Regulation Stretchers Fitted with Special Pedestals That may be Clamped Firmly to the Carrying Frame, are Used on This Two-Decked Motorcycle Ambulance. Straps Hold the Wounded in Place While They are being Transported

done good work in the European war, but so far as is known none until now has been built with capacity for two persons in addition to the driver. They operate between the trenches and field hospitals where treatment is administered and the wounded then taken to trains bound for hospital bases or ships.

HUGE COPPER KETTLE FOR BOILING LEMON PEEL

Recently a well-known brass and copper company in Indianapolis took pride in displaying on the streets of that city a huge copper kettle it had made, which has a capacity of approx-

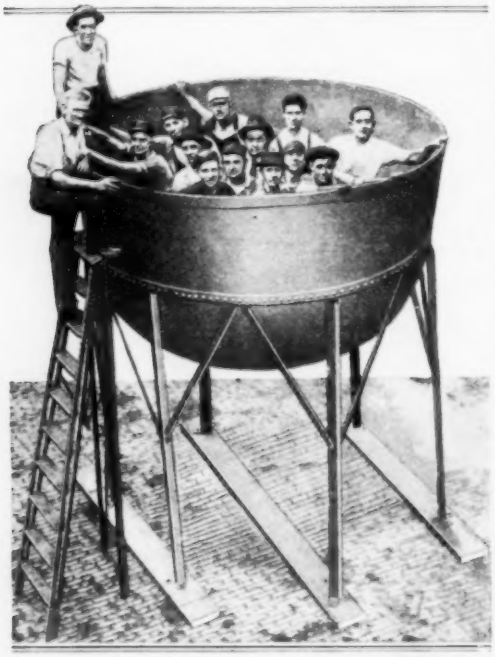


PHOTO BY L. G. NAGLEY

A Copper Kettle with a Capacity of 2,000 Gallons, Which was Recently Completed in a Brass and Copper Works in Indianapolis

imately 2,000 gallons—big enough to hold 12 men without crowding them. Five men worked six weeks to complete it. This is without doubt one of the largest cooking kettles in the United States. It will be used by a fruit company in New Jersey in boiling orange and lemon peel. The bowl consists of a single piece and is steam-jacketed. With its standards the huge utensil weighs 5,000 lb. The assistance of 12 men was required to load it into the box car that carried it eastward.

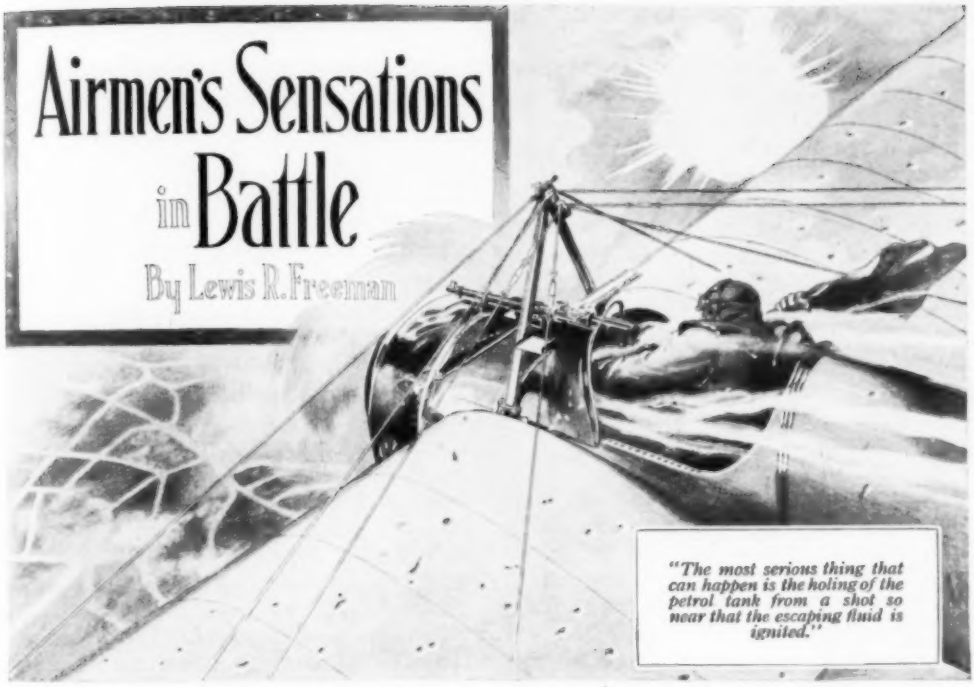
MOVIE VIEWS OF SURGICAL WORK TO AID MEDICAL MEN

After more than a year of effort, the faculty of Johns Hopkins Medical School, at Baltimore, according to reliable authority, has produced over 15,000 ft. of motion-picture film which it will use in teaching surgery. While the views which these films present would be gruesome indeed to the ordinary "movie" fan, they promise to be of the greatest value to medical students. For generations surgery has been taught by charts, by dissection of corpses, by clinics, etc. The limitations in using charts, and corpses in particular, are apparent. But with clear motion pictures the student can study again and again the actual steps taken by surgeons engaged in operating. For some time the representatives of the medical school found it difficult to secure pictures which showed the small but important details clearly. Finally an especially powerful lens, which required more than six months to perfect, was secured for the camera and with it satisfactory results were obtained. In taking these pictures the camera was set on a platform immediately above the operating table so that an unobstructed view could be had. In spite of special precaution several films were spoiled because the surgeons leaned over in front of the camera. In trial presentations of the films, an ordinary projector was used, but it did not prove altogether satisfactory and so a costly machine was built especially for this work. The films will be used during the current school year. They depict both major and minor operations.

¶It is reported that Russia will reconstruct the waterway connecting Archangel with Petrograd so as to accommodate large vessels.

Airmen's Sensations in Battle

By Lewis R. Freeman



"The most serious thing that can happen is the holing of the petrol tank from a shot so near that the escaping fluid is ignited."

THIS is the first of a number of articles describing the actual sensations and experiences of combatants engaged in the several branches of war service which will appear in this magazine from time to time. The author, who is now on the French battle front, is not a stranger to Popular Mechanics Magazine readers. Many important articles by him have appeared in these pages. Few journalists have been accorded the unusual facilities for studying the great conflict at first hand as have been granted Mr. Freeman by the allied powers. Much that he has seen is not for publication at present, but we are safe in promising some exclusive features from this facile pen.—Editor.

Being Shot Down

"ONE may be shot down in a number of ways," said a French airman to whom that experience had already fallen on a half-dozen occasions, "but the three principal causes are a puncturing of the petrol tank and the consequent loss of fuel, the damaging of the engine beyond immediate repair, and being disabled yourself. The most serious thing that can happen is the holing of the petrol tank from a shot so near that the escaping liquid is ignited by the shell. Such a hit from shrapnel, however, usually means that engine and airman have been put out of action also. The machine falls end over end, and the airman is more likely than not to be a cinder before he reaches the earth. I have, for a long time, carried a square of woolen blanket soaked with water against such an emergency and with this I was able to whip out the only blaze that ever started on me.

"It is very rarely indeed that the wings are ever shot up badly enough to bring a machine down. I have had mine like so many sieves and scarcely noticed the effect. Badly shot-up wings, however, compel one to plane down at a steeper angle, and this has brought many a man to earth inside the enemy's lines where a few more square feet of fabric would have carried him to safety. The distance one can plane with a punctured tank or a disabled engine depends upon the height he is at, the direction of the wind, and the condition of his wings. From 10,000 feet one may glide anywhere from 10 to 20 miles. If all of the distance is over the enemy's lines, however, it is more than likely he will be brought down by rifle fire before he reaches safety.

"If you are uninjured from shots or from landing, the effect of being shot down is likely to be no more than

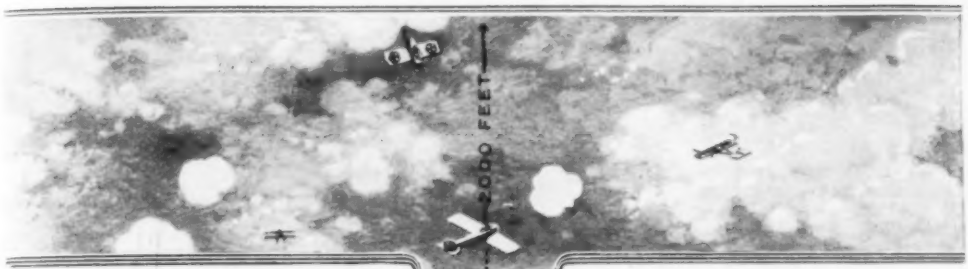
unpleasant. If one drops down in four or five minutes from 12,000 feet the change in pressure is merely an accentuation of that one experiences in making the same descent in a couple of hours on a funicular railway. The air seems heavy — almost liquid — and presses about one with an annoying persistency. The only faculty affected, however, is that of hearing—the ears are as though stuffed full of cotton—and even this passes away within a few hours, but usually leaving a headache behind."

Ascending Too Rapidly

"This is a trouble that has come only in the last few months with the introduction of the swift-climbing machines with which the allies have replied to the Fokker," said a British airman, recently on leave in London. "In the early days of the war a machine was fairly safe anywhere above 6,000 feet, and we were usually able to take our time in getting up there. With the increase in the power and accuracy of anti-aircraft guns, the 'dead line' has rapidly risen, until now they are occasionally bringing machines down on both sides at well up toward 15,000 feet. Not only do we have to go up three times as high as we did, but we also have had to learn to climb more than twice as fast. Now it chances that while about four men out of five are able to stand an altitude of 15,000 feet if taken up to it gradually, not over one in two are unaffected by jumping up to that height in 20 or 30 minutes. As a consequence, a good many men who are capable of doing the most valuable work up to, say, 10,000 feet, begin to fall off very rapidly as soon as they get above that altitude. There is no doubt that disasters have been caused to the machines of both sides by pilots fainting, or at least having some kind of a lapse of faculties, from the effects of too sharp a jump into the thin air. The fact that we have very many less of these inexplicable accidents now than formerly is due to the thorough trying out at high altitudes given to all pilots whose work is likely to carry them above 12,000 feet. Men who complain of dizziness, or anything else likely to interfere with their steadiness of head and hand, when 'hitting the high places,' are not given that kind of work to do. There are plenty of other things left for them; most of our activities, in fact, are comparatively 'low-level' work.

"There is no telling beforehand whether a man is going to be able to stand the high-altitude work or not. Very often, indeed, men physically weaker stand it better than their more robust fellows. A perfectly sound heart is, perhaps, about the only qualification precedent that one can stipulate for a 'highflier.' I am quite convinced that Immelmann and Boehlke, and two or three of the equally successful French pilots, owe their marvelous work almost entirely to the fact that they are quite unaffected by the altitude. I have never seen any of the great Frenchmen at work, but (as I learned later) I was once in the air against Immelmann. This was a few months ago, when the coming of the Fokker and the improved anti-aircraft guns suddenly began forcing us to work at much higher altitudes than formerly. I was scouting, with two other British machines, over the German lines in Flanders. The 'Archies' had forced us up to about 13,000 feet, and I was conscious of feeling distinctly uncomfortable from the rapidly decreased pressure of the air, when a Fokker came nose-diving down out of a cloud fully 2,000 feet above us and fairly riddled our leading plane with machine-gun bullets. The pilot of the latter was killed, and the machine went hurtling down, end over end, into the German trenches.

"Recovering from his dive in a few hundred feet, the Fokker pilot swung in a wide circle and began to climb again for another dive. Realizing that we were out-engined and would, therefore, be out-maneuvered, my own and the other British machine, having completed our reconnaissance, returned to our lines. Comparing notes with the pilot of the other machine later, we



"The 'Archies' had forced us up to about 13,000 feet . . . when a Fokker came nose-diving down out of a cloud fully 2,000 feet above us and fairly riddled our leading plane with machine-gun bullets."

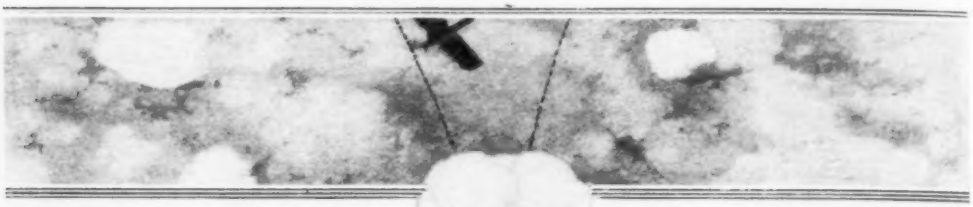
both confessed to having been considerably distressed by the altitude, while at the same time agreeing that the German was navigating about up there, apparently as much at home as a fish in deep water. Immelmann subsequently dropped a note to say that it was he who brought down our leading machine.

"It was at about my third flight following this one that, in endeavoring to get up to over 14,000 feet to get the jump on a couple of German machines that were climbing after me, I almost fainted from the effects of the thin air, and barely managed to pull up from my lapse in time to take my machine and observer back to our lines. That finished my 'top-side' work, and now my activities are confined nearer earth. Also, as I have said, no pilots are now sent up into the thin ether without their having previously shown their fitness to stand that sort of thing. And it is their ability to stand the sudden changes of altitude upon which is based the success of all the spectacular German and French fliers I have mentioned, as well as several of our own.

"The first evidence of the lighter pressure of the air in a quick climb is a slight pricking sensation under the skin, followed by a swelling of the hands and feet, the latter having a tendency to make one clumsy with his levers. Then comes a roaring of the ears, and after that a feeling as if your eyeballs were going to pop out. Indeed, I have not heard one's sensations after a sudden jump to a high altitude better defined than by a pal of mine who said that he felt just like a deep-sea fish looked after it had been brought up out of three or four hundred feet of water and blown up from the expansion of its own air bladders. The queer feelings of the eyes and ears usually lead to a dizziness sufficient at least to impair one's usefulness, if not to cause him to faint. One generally has violent headaches for a week after such an experience."

The Effects of Shell Fire

"Up to the present time," said a British aviator recently who has been flying in Flanders since the outbreak of the war, "the only projectile that has been used from anti-aircraft guns with any success has been shrapnel. The high-explosive shell would, of course, be more effective, but up to very recently the problem of a proper fuse had not been solved. The Germans have been very active with their experiments in this line, and I am practically certain that a rush of air —following an unusually sharp and cracking explosion — which nearly upset me a few days ago



"Shrapnel bullets fly in a broad cone straight in which the shell itself is moving—so that you is the one which bursts ahead—that is, in the same direction as that the only shell that ever does any harm to directly beneath your machine."

came from a high-explosive shell. In any event, you can count on both sides having solved the problem before the summer is over, and then there will be more trouble for the hapless airman.

"The most striking thing to me about being under gun fire in an aeroplane is the unreality of it. The roar of your own engine drowns the sound of the guns on the earth, and even the detonations of the shells which do not burst very close at hand are rarely heard. Shrapnel bullets fly in a broad cone straight ahead—that is, in the same direction as that in which the shell itself is moving—so that practically the only shell that ever does any harm to you is the one which bursts directly beneath your machine, and which, therefore, you do not see explode. The little puff balls of smoke which blossom out around you are perfectly harmless. At the worst, a few of their spent bullets may shower back upon you, sometimes so gently that you can see, and even reach a hand and catch them. A shell bursting even immediately over you is not dangerous in itself, but rather ominous as indicating the fact that the 'Archies' have you well ranged. The back kick from the shell-casing might stun you if it hit you on the head, but the chance of that is almost negligible.

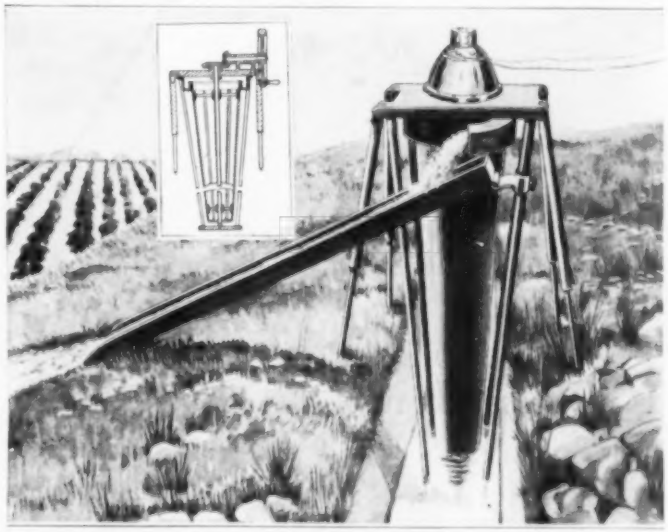
"Ordinary heavy artillery is rarely used against air craft, but occasionally one's work takes him into an air zone in which some of the big shells are traveling. This is one of the most remarkable experiences that can fall to the lot of an airman; in fact, the weirdest sensations of my whole flying experience are connected with the occasion on which I blundered into the road of a passing '42.'

"As you doubtless know, the Germans have used their 17-in. guns for the intermittent bombardment of Dunkirk, and other points 15 or 20 miles behind the lines, right down to the present time. Well, I was at an altitude of about 6,000 feet one day, and climbing higher at an easy angle, when one of these big fellows, almost at the end of its long flight, came plowing along in the opposite direction. First a dark little blur appeared in the air ahead, and at an angle of about 35°—a little steeper than the one at which I was climbing—above me. At first it seemed to be coming right at me, and I swerved to the left in an instinctive effort to dodge the threatened blow. Then a sort of droning hum became audible, even above the roar of my engine, and this sound increased during the two or three seconds that elapsed before the big missile came even with and swept by me. It was probably several hundred yards away, at its nearest, but the distance seemed less.

"A few faint stirrings of air began to rock my machine even before the shell went by, but the full force of the 'air wash' was not felt for a fraction of a second later. Then an almost solid wall of air nearly threw me on my 'beam ends,' and I was really hard put to get the reeling machine back on an 'even keel.' For the next mile or two the air was like the water in the wake of a big side-wheeler—all chopped to pieces—and the machine rocked like a springless motor lorry going over cobbles. The air was disturbed for some seconds after a big roar astern told me the '42' had come to earth."

SIMPLE CENTRIFUGAL PUMP HAS NEW FEATURES

Several new features have been incorporated in a simple centrifugal pump which has been patented recently, and which, it is claimed, has proven in tests to be comparatively economical to operate and capable of handling liquids in which there is a heavy sediment. There are few parts to get out of order. Outwardly the principal part of the pump resembles an inverted cone, cut off near its point, that is revolved by a vertical shaft extending down through its center. The lower end is open and is immersed in the water. As the cone revolves, water is thrown against its inner wall. It gradually mounts the diverging sides under the influence of centrifugal force, and is finally discharged into a spillway. One of the devices by which the lifting power is increased is a horizontal flange which extends around the intake and is attached at its outer edge to the cone. This serves to support a certain amount of water until it has acquired momentum enough to rise. Four propeller blades are situated radially at the lower end of the driving shaft and turn with the rest of the cone. They serve to start the water to whirling swiftly as soon as it enters the intake, and so they too augment the lifting power of the pump. Still another device which aids in this respect is a set of three vertical ribs fastened to the wall of the cone with their inner edges extending toward the center. They are wide at the bottom and taper toward the top. The pump can be driven by any preferred power and with minor changes can be used for dredging and the like. It is well adapted to irrigating.

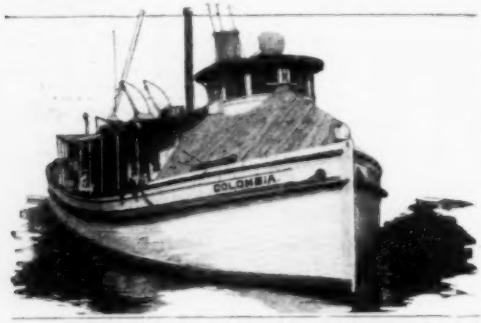


A Comparatively Inexpensive Centrifugal Pump Whose Lifting Power is Augmented by a Propeller at the Intake, and by Other Features

QUEER LITTLE BOAT CLEARS BALTIMORE FOR COLOMBIA

Some weeks ago a strange-looking little auxiliary vessel chugged out from Baltimore bound for Colombia, where its owners expect to trade with the natives and procure a cargo of ivory nuts, and hides. Before the expedition put out, the boat was thoroughly over-

hauled and outfitted for the long voyage so as to render it fit for weathering the severe tropical storms that may be encountered. One part of the remodeling gave the boat its unusual appearance. At the bow a wood falsework was erected, giving the craft a nose that is almost similar in general aspects to that of a destroyer. This was done so that it might ride a heavy sea without being swamped by waves breaking over its deck. The vessel cleared for Cartagena and will spend some time cruising one of the tropical rivers.



The Hoodlike Structure over the Bow of the "Colombia" is Intended to Prevent the Small Craft from being Swamped during Tropical Storms

HAND-DRAWN FIRE CARTS FOR PHILADELPHIA PARK

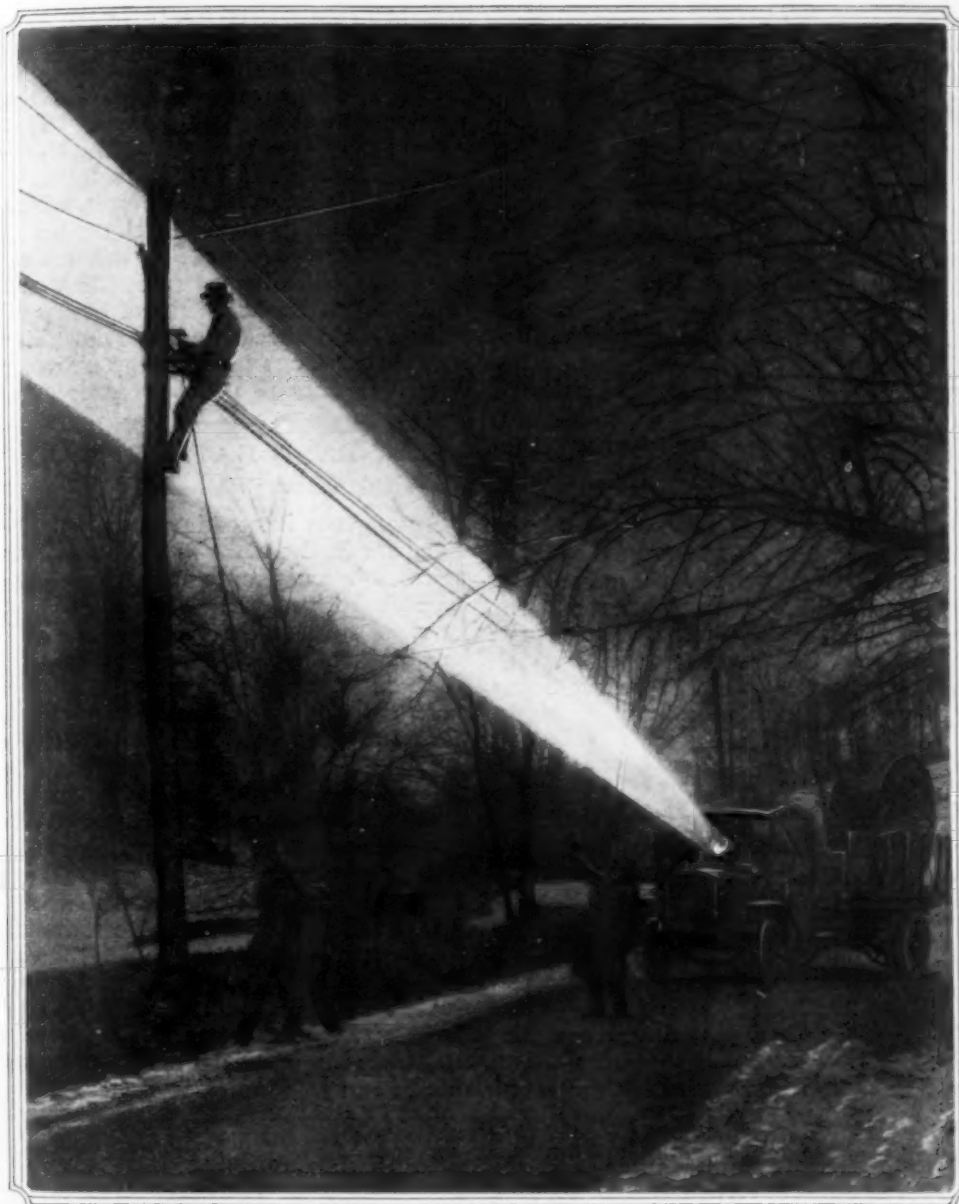
So extensive is Fairmount Park, Philadelphia, and so thickly wooded are certain portions of it, that forest fires are a serious menace during the dry season. Because the equipment of the city's fire department has proven unsuited to fighting fires which have started in these forested regions, the park authorities have provided special fire-fighting apparatus consisting of several two-wheeled carts which carry chemical tanks and several feet of hose. These are placed in suitable shelters throughout the park and, being light and narrow, can be drawn by hand even in such hilly wooded regions as that through which the Wissahickon Creek flows. It is believed that damage amounting to many thousands of dollars will be avoided each year because of the protection these fire carts will afford. Their effectiveness is greatly increased by being close at hand.

One of the Light, Narrow Fire Carts in the Hilly Wooded Sections of Fairmount Park, Philadelphia

"SUGAR FLOUR" MADE BY DRYING BEET PULP

The drying of fresh sugar-beet pulp, thereby transforming it into what is called "sugar flour," is now being undertaken in northern France as a commercial proposition. The purpose of this process is much the same as the desiccation of potatoes, which has been described in Popular Mechanics Magazine, namely, to eliminate the moisture from the vegetable matter so as to reduce its weight and make it possible to preserve part or all of the food value for some time. This new sugar flour has a certain amount of sweetness and can be used in cases where pure sugar is not required, as, for example, in certain brewing processes, in making special breads, feeding stock, and the like. In preparing it, fresh beet pulp is poured into the top of a tower where it comes in contact with warm air and then is delivered into a rotary device on a set of gratings, placed one above the other. Next it is subjected to hot air and eventually reaches air heated to 248°. A ton of beets will yield 500 lb. of flour. It is thought that other drying processes may be invented which will make it possible to utilize many other industrial residues which are now thrown away.

SEARCHLIGHT HELPS LINEMEN IN MAKING REPAIRS



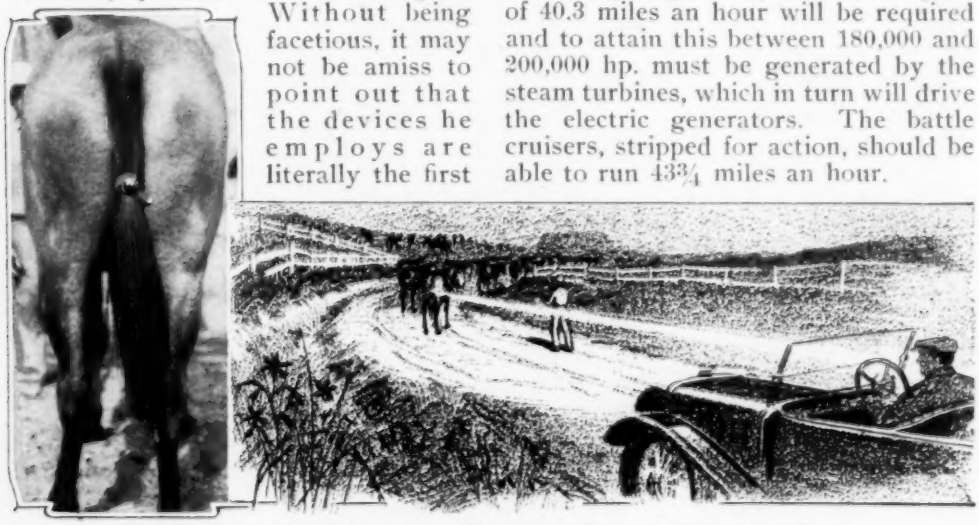
TO assist telephone linemen in making repairs at night when trouble crops out some place along local or long-distance circuits, an emergency truck at Philadelphia has been provided with a small searchlight. The installation has proved valuable not only in facilitating the work, but in promoting safety. When it becomes necessary to repair wires that are close to high-tension electric transmission lines, the lamp gives a man at least an equal chance in avoiding danger. When the light is thrown directly against a pole where work is being done, or along a line of them where wires are being restrung, the advantage is obvious. It was following a severe storm more than a year ago, when many wires were torn down, that a local electric-light company pressed into service an armored motor car that had a very efficient searchlight equipment. With its aid repair work was carried out with great dispatch, and it is assumed that the benefits derived at that time were in a measure responsible for the adoption of the present equipment by the telephone company.

HAND-WROUGHT CONCRETE BIRD BATH

Individuality and beauty mark a simple bird bath made of concrete, which adorns the lawn of a home in Omaha, Neb. At a glance it appears to have been made by placing a thick cross section of a big log on top of a stump in the yard. But both parts are made of concrete. The imitation bark on the sides, instead of being fashioned with a mold, has been worked out by hand so that it contains less of a suggestion of the artificial than is found in many molded-concrete lawn ornaments. A number of these rustic baths have been made.

CALIFORNIA DEALER EQUIPS MULES WITH TAIL LIGHTS

Ludicrous as it may seem, necessity has demanded that a Los Angeles drover equip his mules with tail lights. Without being facetious, it may not be amiss to point out that the devices he employs are literally the first real tail lights ever used. Some time ago when a number of the man's mules were being driven along a highway at night, a motor car plunged into the drove with disastrous results. This caused the dealer to resort to the warning lights so as to avoid similar accidents in the future. The devices, which are identical to those used on many bicycles, are strapped to the mules' tails. When the glare from the lamps of a motor car strikes them, beams of ruby light are reflected. Incidentally if a mule swings his tail, the warning signal becomes all the more noticeable.

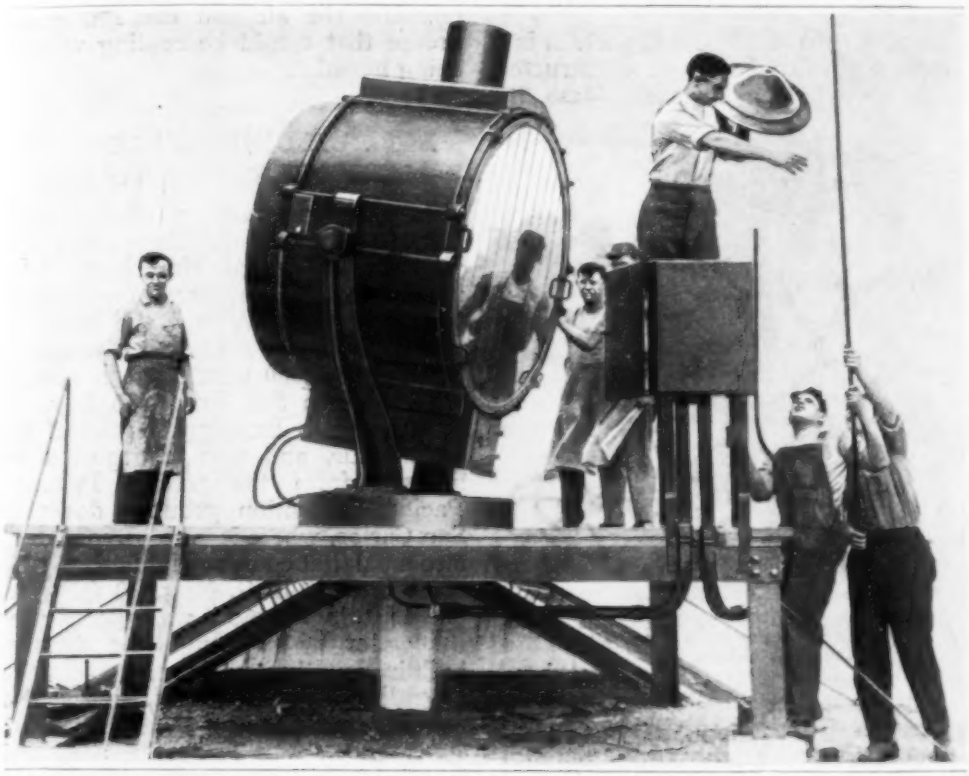


When Mules are being Driven along a Highway at Night, the Ruby Signal Devices are Strapped to Their Tails

NEW BATTLE CRUISERS TO BE ELECTRIC-DRIVEN

Among the interesting features provided for in the plans of this country's new battle cruisers, four of which have been authorized to be laid down next year, is the fact that each vessel will be oil-burning and electric-driven. Each of the new fighting machines will have six or more funnels and, when the occasion demands it, will be able to give off great clouds of black smoke that will serve as a concealing screen to other ships. On the other hand, the equipment of the vessels will be such that they can proceed, if so desired, without giving off any smoke. A speed of 40.3 miles an hour will be required and to attain this between 180,000 and 200,000 hp. must be generated by the steam turbines, which in turn will drive the electric generators. The battle cruisers, stripped for action, should be able to run 43¾ miles an hour.

GIANT SEARCHLIGHT BUILT BY EASTERN INVENTOR



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This, the Most Powerful Searchlight in the World, Develops More than a Billion Candlepower: It is Shown Here Mounted on Top of a Brooklyn Building Where It is being Used for Experimental Purposes

What is heralded as the world's most powerful searchlight, a big instrument that is reported to be capable of developing approximately 1,280,000,000 candlepower, has recently been erected on the roof of a manufacturing plant at Brooklyn, where it is being used for experimental purposes. Its designer is one of the best known of American inventors. If the instrument produces as intense light as is said, it apparently surpasses by more than 60 per cent the power of the great lamp tested some time ago at the New York Navy Yard. During experiments a couple of years ago the latter was equipped with a 44-in. reflector and gave off a light estimated at 450,000,000 candlepower. It was said that under favorable atmospheric conditions the glare could be seen for fully 100 miles, while objects 35 miles away were made plainly visible.

The most important feature of the new searchlight is its arc. In addition to the brilliant light obtained from the heated surface of the positive carbon, use is made of the intensely bright flame produced through the combustion of the superheated vapor that is given off. To employ the gas successfully it is necessary that it be confined in an exceedingly small area. This is accomplished by maintaining a very deep crater in the positive carbon, in which the vapor is concentrated. As a result the luminosity emanating from the mouth of the crater amounts to about 320,000 candlepower to the square inch. The instrument is exciting pronounced interest in technical and scientific circles.

ELECTRIC FAN OPERATES FOUR AUXILIARY FANS

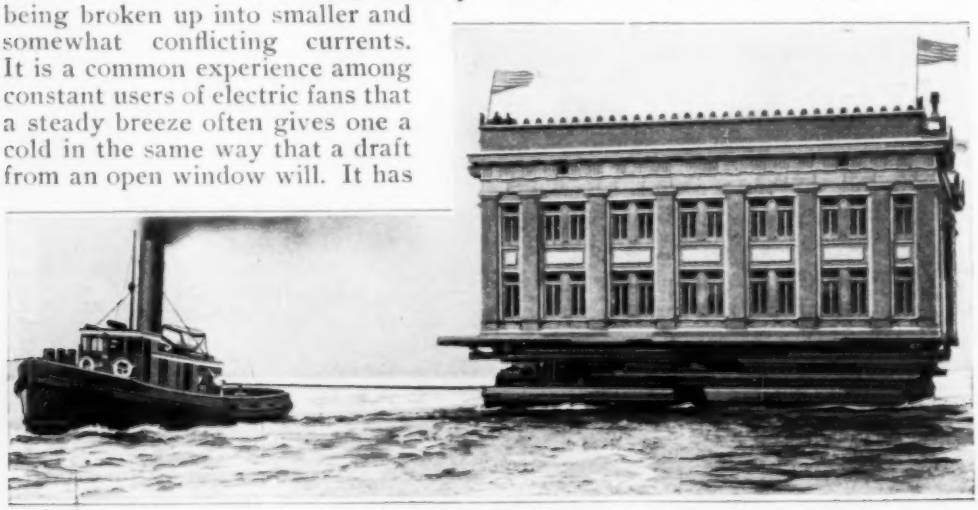
A new type of electric fan which is a distinct novelty has been constructed by an electrician in Pittsfield, Mass., by

The Small Fans are Driven by the Big One and are Intended to Modify the Direct Draft by Making Conflicting Currents

mounting four small fans a few inches in front of the large fan by attaching them to the wire guard of the latter. The breeze from the big blades causes the small ones to revolve rapidly and at the same time the direct force of the draft is diminished by being broken up into smaller and somewhat conflicting currents. It is a common experience among constant users of electric fans that a steady breeze often gives one a cold in the same way that a draft from an open window will. It has been the purpose of the inventor of this novelty to devise a fan that would circulate the air and cause a gentle breeze that would be cooling without being harmful.

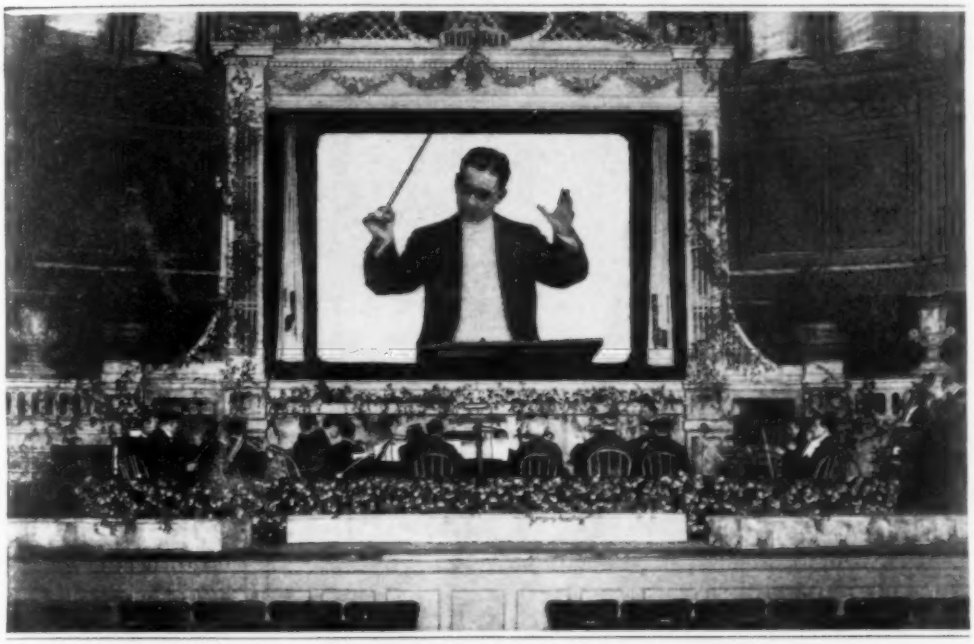
BIG BUILDING IS FLOATED MANY MILES TO NEW SITE

In different parts of the country from time to time dwellings and buildings of moderate size have been moved various distances across water to new sites. Within the last few weeks, however, a structure weighing more than 1,000 tons made a 23-mile voyage down San Francisco Bay. It was the Ohio Building, a relic of the recent fair, and was transported on lighters from the former Panama-Pacific Exposition grounds down to San Carlos, where it is to be converted into a palatial country clubhouse. The structure is 131 ft. long, 80 ft. wide, and 43 ft. high. As it was piloted over the water by two tugs, the massive building with its broad colonnade extending across its front, presented a most striking, not to say startling, appearance. The feat of moving the building, which is a noteworthy one in some respects, was executed skillfully, and the structure delivered at the new site practically without injury.



The Ohio Building from the Panama-Pacific Exposition, Weighing More than 1,000 Tons, Proceeding down San Francisco Bay in Tow of Two Tugs

ORCHESTRA IS CONDUCTED BY MOVING PICTURES



Conducting an Orchestra at Chicago with the Aid of Motion Pictures: The Idea has Worked Splendidly in Actual Practice and Seems to Hold Possibilities That Make It More than a Mere Novelty

At Chicago an orchestra is being conducted by means of motion pictures instead of a personal director. While the innovation is little more than a novelty at present, the idea seems to hold splendid possibilities and therefore is attracting attention and comment. In practice the scheme works out most satisfactorily.

The system, as it is employed at Orchestra Hall, consists simply of projecting on a screen, in full view of the orchestra, animated pictures of a conductor in the act of directing the rendition of "William Tell," Mendelssohn's "Spring Song," or whatever composition is to be played. Obviously, the enlarged picture of the director is more conspicuous to the musicians than a man himself could be, and it is therefore more easily followed. Since nearly all projection machines are motor-driven, it is not difficult to time the reeling perfectly so that no trouble is encountered. In carrying out the plan, the only change from usual practice that must be made is that the musicians shift their positions, for on the screen the conductor faces the audience instead of turning his back to it.

Some of the merits of the arrangement may not be entirely apparent at first sight. For instance, the possibility is opened up of preserving the interpretations of our greatest directors, just as the voices of the world's foremost singers are immortalized by the phonograph. Still further, the arrangement makes it possible for small orchestras anywhere to have the advantages of being directed by the greatest conductors. And to carry the visualization an additional step, the plan makes possible the massing and directing of an orchestra or band of tremendous size. Before the Panama-Pacific Exposition closed, there was thought of trying out this scheme and bringing together at one time some 200 bands. For one reason or another the idea was not executed, but the possibility of doing so still remains.

SOME UNUSUAL PICTURES WHICH PORTRAY

Russian Concert Singer in New York Wearing Mourning Garb Adopted by the Ladies of the Russian Court. Several Women of Noble Birth, Together with the Czar's Daughters, have Vowed to Wear Nothing but Black Until Victory is Won over Germany

Chief of the Mothers' Police of Brooklyn being Sworn In. The Organization, of Which This Woman Is the Head, is Composed of Mothers and Other Interested Women Who have Actively Enlisted to Assist the Regular Police in Suppressing the White-Slave Evil

An Indian Dancer Wearing a Necklace and Other Oriental Ornaments Now Much in Vogue: Mandarin Necklaces, Particularly, Are Very Popular. They Always Have 108 Beads, though the Material of Which They are Made may Range from Carved Wood and Filigreed Seeds to Colored Glass and Precious Stones. These Necklaces Are Usually Distinguishable by Certain Pendants, Each of Which Has Its Sacred Significance to the Oriental. Bracelets and Hair Ornaments are Worn to Match the Necklace

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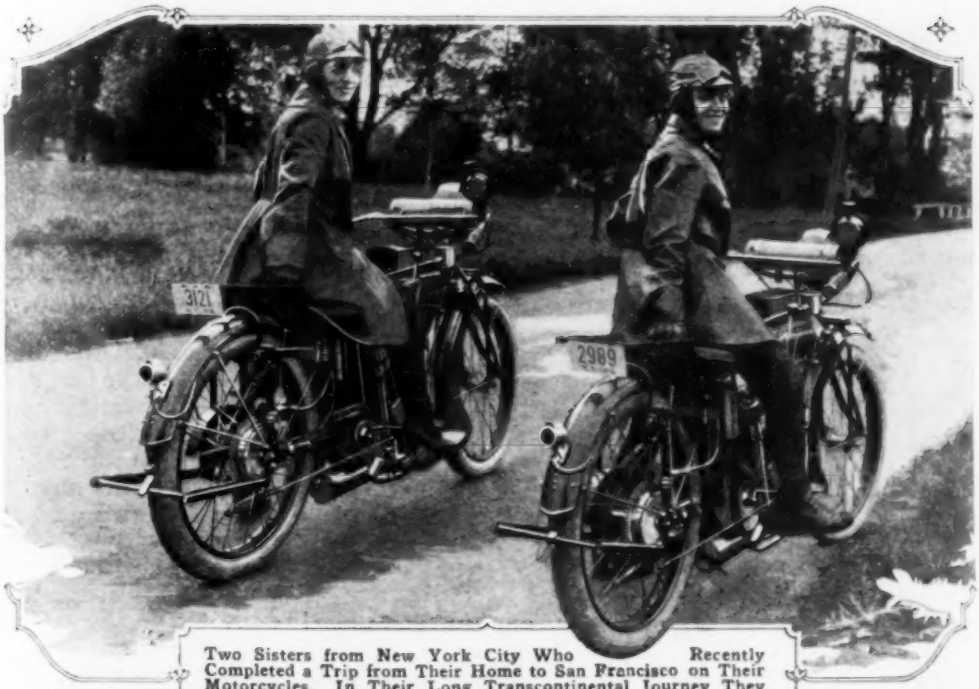
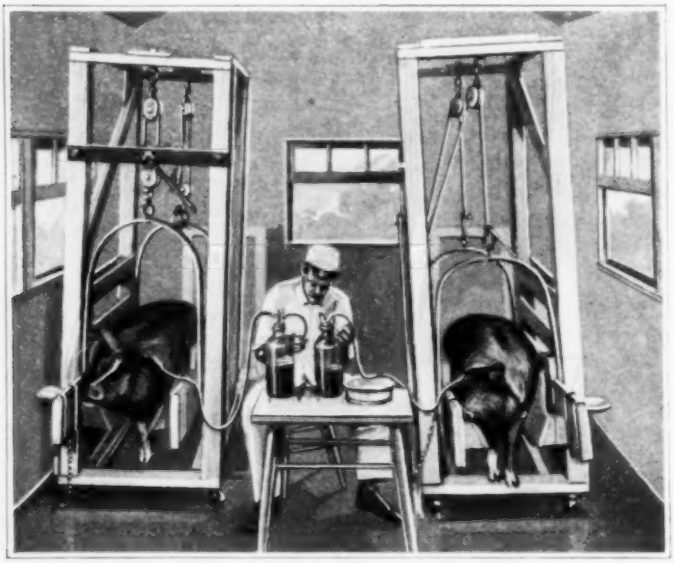


Two Sisters from New York City Who Recently Completed a Trip from Their Home to San Francisco on Their Motorcycles. In Their Long Transcontinental Journey They Encountered Floods, Mountain Slides, Incessant Rains, and Wrecked Bridges, but Their Persistence and Hardihood Brought Them Through Safely

A Novel Race on a Long Island Beach: These Low Motor Vehicles have Become Very Popular among Patrons of Eastern and Southern Resorts. They are Driven by Gasoline and can Develop Considerable Speed

MAKING HOG-CHOLERA SERUM AND VIRUS

Recent years have witnessed such a general adoption of the practice of vaccinating hogs to protect them from cholera that the scientific production of serum and cholera blood, or virus, has become a commercial undertaking of considerable magnitude. Anti-hog-cholera serum is made from the blood of a hyper-immune hog. In producing this serum an animal is selected which has had cholera and has recovered or has been vaccinated. It is placed in a portable crate and wheeled into a laboratory where a block and tackle is employed to raise it up in a frame so that it cannot move. An incision is then made in the animal's ear and the proper amount of virus injected into one of the veins through a rubber tube. An injection of about one quart is used for an animal weighing 200 lb. If the hog survives this infusion of diseased blood it is killed at the end of two or three weeks and its blood is drawn off and used for serum. It is not used, however, until a post-mortem examination shows that the carcass is in a healthy condition. It is now a well recognized practice to inject cholera-infected blood into an animal at the same time that it is vaccinated with the serum, thereby giving it immunity for life. To procure this virus for commercial purposes a healthy hog is taken into the laboratory and infected blood injected into its veins. When the animal has become seriously sick it is killed and the infected blood drawn from the carcass for future use.

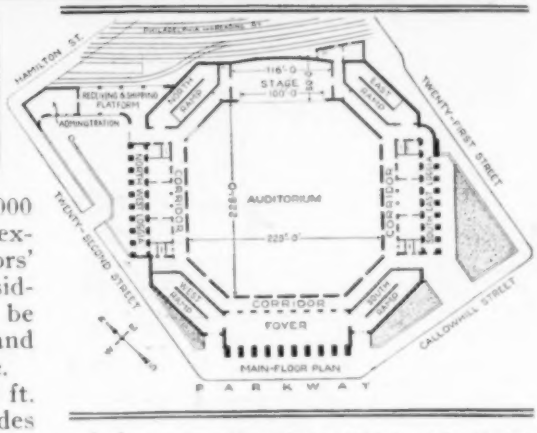


Injecting More than a Quart of Cholera-Infected Blood into Each of Two Hogs That Are Already Immune: The Blood of These Animals will Later be Used for Serum

PLAN BIG CONVENTION HALL FOR PHILADELPHIA

Philadelphia is about to construct one of the finest municipal auditoriums in the country. The plans for the massive structure, which, it is estimated, will cost approximately $2,000,000, have been prepared and it is expected that the hall will be erected and ready for occupancy within a year or more.

The building will be of octagonal form and combine classic and Romanesque architectural features. It will be situated on a boulevard adjacent to Fairmount Park and within five minutes' walk of the business center. Seating accommodations will be provided for about 15,000 persons. One of the especially good points about the arrangement of the building is that the exits are designed so that the auditorium can be cleared of a capacity crowd in a very few minutes. Broad, gradually inclined ramps will be constructed on opposite sides of the foyer and stage to facilitate this.



Classic and Romanesque Architectural Features are Incorporated in This Great Municipal Auditorium Which Philadelphia Plans to Construct near Fairmount Park. Both Its Arrangement and Proposed Location Are Good. A Clear Idea of the Interior Aspects is Afforded by the Drawing at the Right, Which Shows the Main-Floor Plan

There will be approximately 91,000 sq. ft. of floor space available for exhibits. Best of all, from the exhibitors' standpoint, there will be railway sidings at the rear so that cars can be loaded and emptied at a receiving and shipping platform close to the stage.

The main auditorium will be 225 ft. in length and breadth. At two sides of it, on the main floor, lobbies and committee rooms are to be arranged. On the balcony level, immediately over the foyer, a small auditorium with capacity for about 1,000 persons, is to be furnished, and convenient to it a number of committee apartments. The gallery floor will have four halls of suitable size for gatherings of from 300 to 400 individuals.

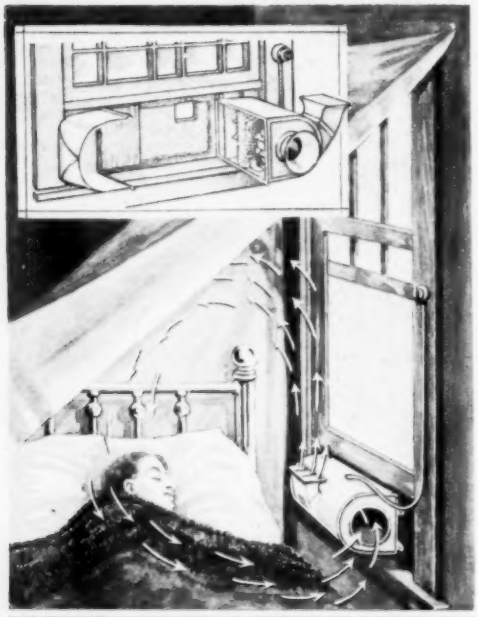
Bordering the walls of the structure in the basement, a café, cafeteria, emergency hospital, and telephone and telegraph rooms will be established. The central part of the basement space, corresponding in area to that occupied by the auditorium on the first floor, will be available for exhibits. The stage is to have a 100-ft. opening and be about 50 ft. in depth, so that there will be adequate room to permit the seating of several hundred persons.

The exterior of the building, which will occupy a site 348 ft. in width and 362 ft. in depth, will be finished in light-colored limestone. On three sides there will be broad porticoes with massive Corinthian columns. The tympanum of the pediment surmounting the portico fronting on the boulevard side, will be ornamented with an allegorical group of figures in high relief.

TWO-FAN VENTILATOR FOR OFFICE OR HOME

A two-fan electric ventilator has been devised for use in offices, stores, and homes where natural ventilation is insufficient and larger forced ventilating systems cannot be easily employed. The machine is housed in a metallic case somewhat less in length than the width of a common window. It is operated by current from any ordinary electric-light socket. In the center of the case, mounted on a slab of pressed cork so as to deaden the noise, is the

motor. Directly connected with it, one on each side, are blower wheels. One serves to draw in fresh air and the other to expel foul air. The vent,



An Electric Ventilator, Having Two Blowers, Which can be Easily Inserted at the Top or Bottom of Any Window. The Insert Shows the Two Parts of the Case Swung Open

which determines the direction of the fresh-air current, is adjustable. The case is made in two parts and can be opened up for oiling, etc. The ventilators are built in three sizes capable of delivering 5,000, 7,500, and 10,000 cu. ft. of air per hour, respectively. They are designed to be inserted at the top or bottom of a window.

BEGINNERS PLAY VIOLINS IN LESS THAN MONTH

During the recent session of the teachers' summer school at New York University, interesting results were accomplished with a short-cut system of violin instruction. Fifty pupils, none of whom at the outset could play, were given a three-weeks' course in the rudiments of music and violin technique. Before the term was completed, many of those enrolled in the class could play remarkably well for beginners. The director of this unusual department abandons most of the orthodox principles of instruction and brings into use a large number of special devices for the aid of novices. Contrary to the usual practice, he requires his pupils to fit their instruments with patent chin and shoulder rests which are intended to assist beginners in learning to hold a violin properly at the very outset. Furthermore, patented pegs, which make the tuning of an instrument a simple matter, and metal strings, are employed. Charts are also pasted to the necks of the violins to help pupils

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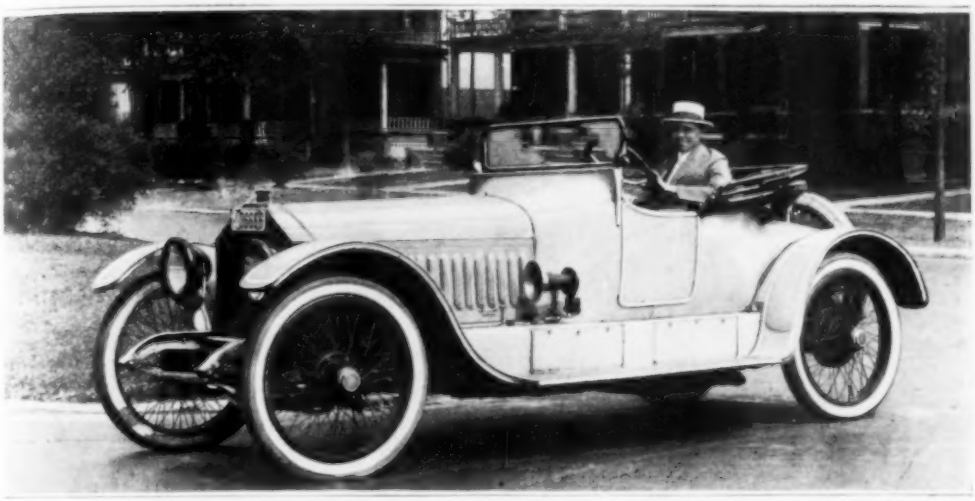
Two Weeks Before This Picture was Taken, None of the Young Women or Men could Play a Violin: The Class is Shown on the Campus of New York University Playing a Standard Selection in Unison



This Car has been Operated 33,000 Miles during the Last Three Years, and is Said to have Required No Repairs. It is Driven by Steam and Introduces Strikingly New and Attractive Features

learn the proper finger positions quickly. Neither the methods, nor the three weeks of instruction, are purported to produce finished artists, but it is said that the short course gives apt students a sufficient knowledge of the instrument to fit them for teaching the subject to children in public schools.

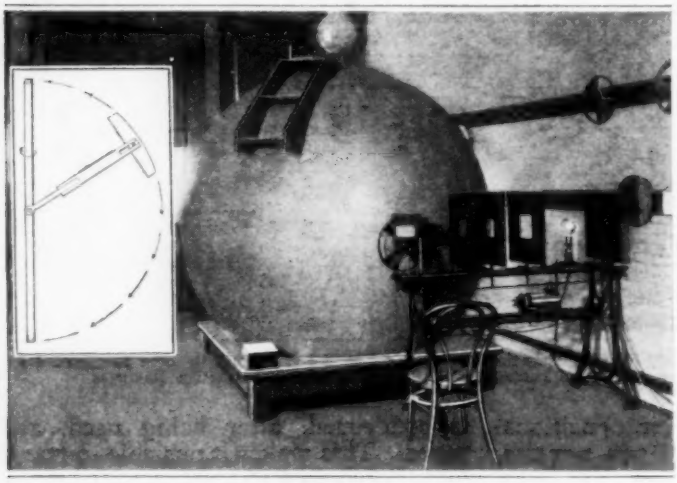
NEW STEAM AUTO POSSESSES REMARKABLE FEATURES

As a result of prolonged experiments, a Detroit inventor has developed a steam-power automobile which seems to obviate most of the objections usually presented by vehicles of its type. In a general way it embodies many of the best features of both gas and steam cars. By turning a switch and opening the throttle, the car is started almost instantly. There are no gears, levers, or clutch to operate, while unlimited flexibility is afforded. From a snail's pace to a speed of 80 miles an hour, the car is said to run practically without engine vibration. There is no noise, and nothing to watch but the road. So far as appearance is concerned, the machine would ordinarily be mistaken for a gasoline car. Fourteen miles can be covered with a gallon of kerosene. The steam is condensed, after being used, and saved. This makes it possible to travel from 1,300 to 2,000 miles without replenishing the water supply. The formation of scale or rust in the boiler is prevented, since the lubricating oil is carried to the engine by the steam. Thus the inside of the tubes is constantly coated with a thin film of oil. The experimental car has been driven 33,000 miles during the last three years without repairs, and is claimed to be in perfect running condition. The fuel is vaporized, mixed with air in a carburetor, heated, and burned in a specially designed combustion chamber. A small electric blower supplies the necessary volume of air, while the ignition is accomplished electrically. The latter is the striking feature of the system, for it relieves the driver of the necessity of giving attention or labor to the matter of firing the boiler. In case the car stands inactive for several days, about a minute and a half is required in starting it. If, however, it has merely been idle overnight, or during a corresponding period, it starts at once.

¶ Electric reflectors have been provided in a St. Louis park with which a rare collection of water lilies is illuminated at night.

DEVICE FOR ASCERTAINING SPHERICAL CANDLEPOWER

The difficult task of accurately measuring the spherical candlepower of various types of lamps is now often performed by using an integrating sphere. Such a sphere, 88 in. in diameter, was completed a few months ago for the Bureau of Standards, at Washington. Because most lights give off more light rays in some directions than they do in others it is necessary in rating a lamp to learn the average of the brightness of all of its sides. It is this average which is called the spherical candlepower. The bureau's new sphere is made of concrete, reinforced with a steel frame, and weighs 3,500 lb. The inside wall, which is of white cement, was given a uniform curve by using a sweep fastened in the center of the sphere and then swung about in all directions. Lamps to be tested are lowered into the globe through a hole in the top. Because the curve of the inner wall is uniform, the light of the lamp is uniformly diffused over all portions of the interior, regardless of the fact that one side of the lamp may be brighter than another. In one side of the sphere is a small opal-glass window, shielded from the direct rays of the lamp but receiving its full proportion of reflected light. The light passing through this window is what is measured to determine the spherical candlepower of the lamp. Its value is ascertained by comparing it with certain standard lamps. The use of integrating spheres is not new, but the perfection of tungsten lamps, and others giving out light that varies at different angles, has brought this means of measurement into general use.



Hollow Sphere, 88 Inches in Diameter, in Which Lamps are Tested by the Bureau of Standards to Ascertain Their Spherical Candlepower

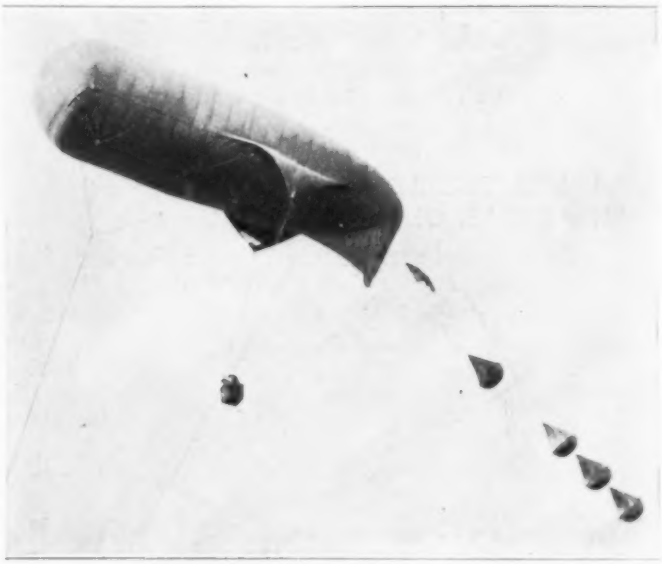
SEATTLE GARAGE RUN ON SELF-SERVICE PLAN

The self-service idea has invaded the realm of the garage. Just as one can enter certain restaurants or groceries and help himself and be charged for what he gets, so now a car owner can take his automobile into one of the separate compartments provided in a Seattle garage, procure tools at the garage office, and do his own repairing. When he has finished, he returns the tools to the office and is charged according to the time he has occupied the room and for the tools he has used. These private repair spaces can be locked so that one can safely leave his work and return and finish it later. If a helper is desired, one can be procured at a specified rate.

NEW TYPE OF KITE BALLOON IN USE AT PENSACOLA

Several advantageous features have been incorporated in a new kite balloon lately constructed for use at the navy aeronautical station at Pensacola, Fla. It is a duplicate of one presented a

number of weeks ago to the Ohio National Guard and, according to reports, has performed very satisfactorily during tests. In comparison with captive balloons of the ordinary design, correspondents declare it to be manifestly superior in numerous details, but information in this regard has not been specific. One of the noticeable differences in its design from observation craft of the sort employed in European countries is the total absence of the sausagelike rudder bag at the posterior end. An additional feature which is somewhat distinctive is the provision of an air flap or pocket on the under side, near the middle. This is held open by guy lines extended from the free edge to the observer's basket swung far below, and is understood to give the device, with the help of the tail cups, considerable stability. To facilitate the handling of the balloon, a reel accommodating 2,000 ft. of cable and operated by power transmitted through a flexible shaft from a rear wheel of a motor car, is employed. The envelope is 81 ft. in length and has a maximum diameter of 22 feet.



The Balloon is Held Captive by a Stanch Cable Wound on a Stationary Reel That is Driven by Power Conveyed from a Motor Car. This Arrangement is Employed Only When the Balloon is Used over Land

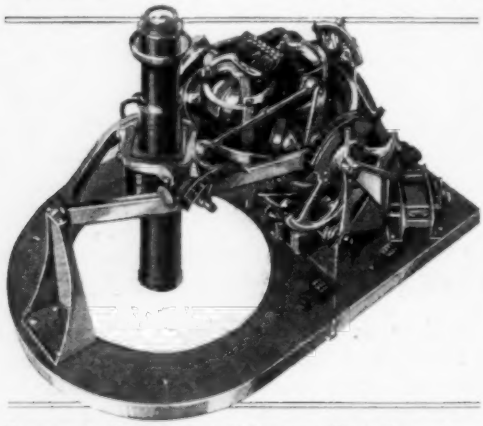
DEVICE ADDS TO RIFLES' MAGAZINE CAPACITY

The rifles of German soldiers captured during recent weeks on the eastern battle fields are reported to be equipped with a new attachment which increases their magazine capacity to 25 cartridges. Heretofore it has been necessary to reload these arms after firing five shots. The new device is regarded as especially adapted to fighting in open or field warfare, such as obtains on the Russian and Galician fronts. For that reason, the newly captured prisoners declare, all the

eastern armies of Germany will be equipped with these attachments before they are distributed among the soldiers in the trenches in France and Belgium.

USE STABILIZED TELESCOPE IN AERIAL OBSERVATIONS

For purposes of aerial observation, a gyroscopic apparatus has been invented that holds a monocular tele-



Gyroscopically Stabilized Telescope of Late Invention, Intended to Aid an Aerial Observer in Making Observations. Its Specific Purposes and the Details of Its Construction are Not Generally Known

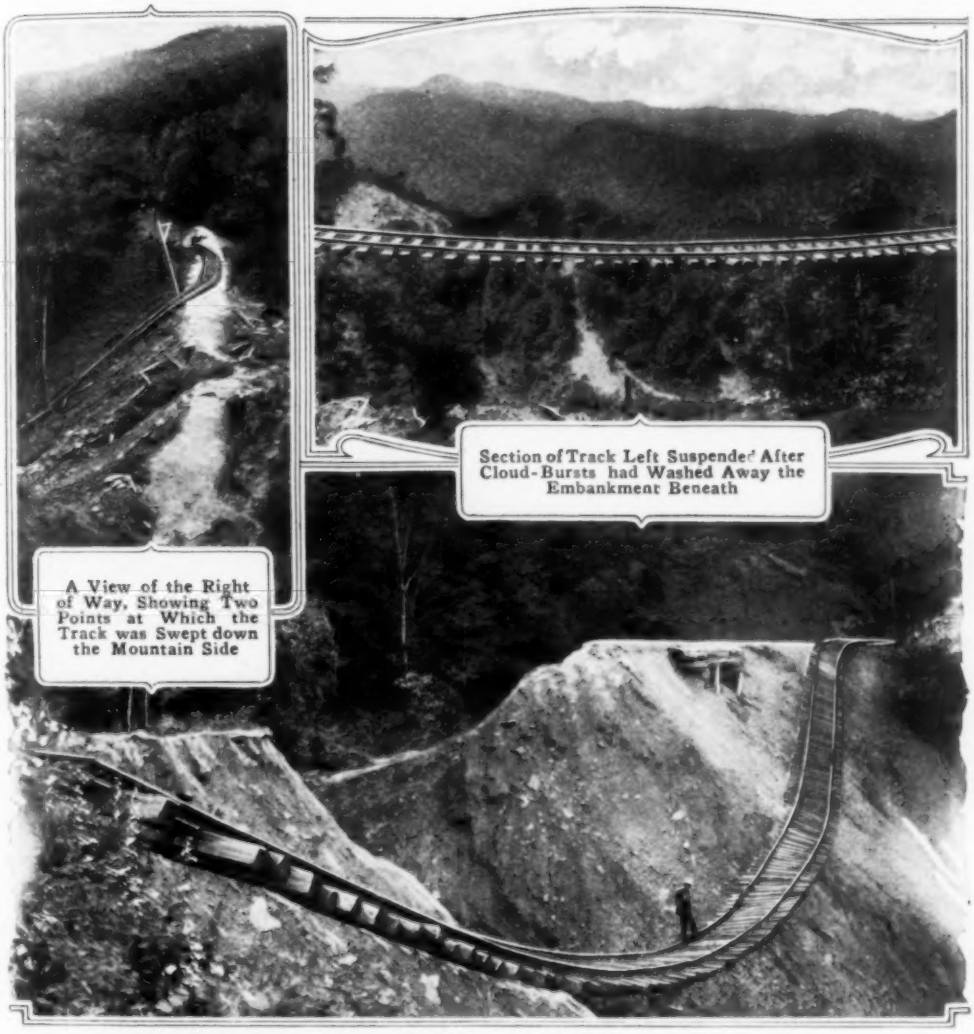
scope in a vertical position at all times, regardless of the varying angles assumed by an aeroplane in the course of flight. The technical details of the instrument and the precise function it fills are things that have not been divulged. The telescope is apparently mounted so that it can be tilted back and forth and from one side to the other by an operator. Three verniers are used, and at least one of them undoubtedly indicates in degrees the telescope's variation from zero, or the perpendicular, when it is sighted upon some object by an observer. If this surmise is correct, the device enables a military airman to determine the distance between two points, for his barometer registers his altitude. Knowing his height, and given the angle between two positions, it is a simple matter for him to compute distance. Such calculations would enable an observer to obtain the ranges of enemy batteries or positions with considerable accuracy. It is apparent, also, that if the distance between two points is measured at the time a photograph is made of hostile territory, the value of the picture will be materially enhanced for military usage. The new instrument is suited for air craft of any type. The assumptions regarding its possible capabilities, other than that it is employed in making observations, are not presented as authoritative in any sense. The device is doubtless an important invention, and has been developed in America. It is assumed, but not known, that it is being used in Europe at the present time.

BIG RAILROAD DISCARDS WHITE SIGNAL LIGHTS

A sweeping change in the color scheme of the signal system used on the Pennsylvania Railroad is to be made as soon as new glass, which has been ordered, can be procured. White lights are to be eliminated altogether as a signal indication. Green will replace white in indicating "clear track" or "proceed," while a bright yellow light, visible long distances, will be used for "caution." As heretofore, red will mean "stop." The increasing number of white lights on buildings, driveways, etc., close to the railroad's right of way have made the elimination of white lights for signal purposes almost imperative. However, the Pennsylvania lines did not approve of the change until a yellow glass had been obtained, which makes a bright light that is visible long distances and cannot be confused with white. The change will involve making alterations in many thousands of lamps, including all lights on the rear of trains, all switch lamps and targets, markers for track tanks, "slow" signs, "proceed" signs, and many others.

¶Many women in western states are adopting the custom of wearing overalls while gardening and doing housework.

CLOUD-BURSTS WORK HAVOC TO BLUE RIDGE RAILWAY

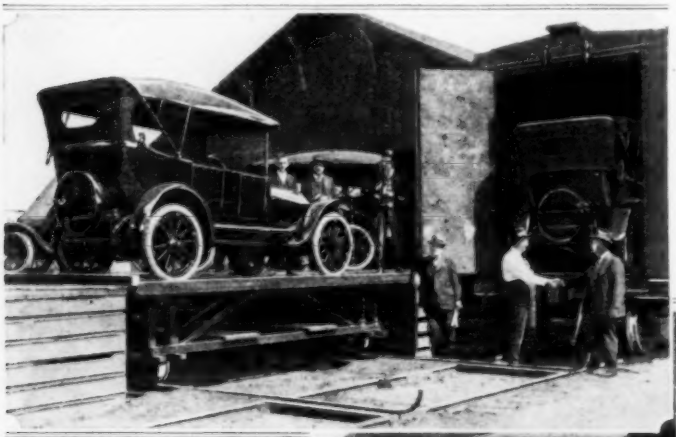

Section of Track Left Suspended After Cloud-Bursts had Washed Away the Embankment Beneath
A View of the Right of Way, Showing Two Points at Which the Track was Swept down the Mountain Side

One of the Big Gaps Cut by the Flood at a Point Where the Railway Culverts Proved Utterly Inadequate

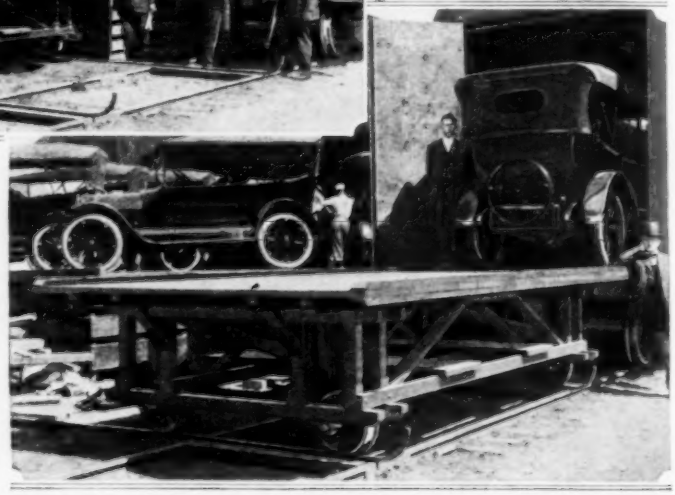
So great was the volume of water that fell during the cloud-bursts which occurred last summer in the vicinity of Asheville, N. C., that traffic on several railway lines was seriously interrupted. The Southern Railway suffered particularly severe damage at Round Knob, in the Blue Ridge Mountains of western North Carolina. The picturesque slopes, through which the railway winds, quickly accumulated great torrents of water for which the railroad culverts were entirely inadequate, and consequently enormous gaps were cut by the flood in the embankments. At one point a stretch of almost level track was left hanging high above the ground like a suspension bridge. At another point the swift current tore the track in two and left the rails and ties strewn far down the mountainside. Large crews of men were engaged several weeks in repairing the damage.

AUTOS UNLOADED CHEAPLY WITH MOVABLE PLATFORM

The difficulties attendant upon the unloading of automobiles from box cars have been overcome by a patented invention which is being installed at several stations on the Santa Fe line. The invention is used in unloading freight cars that have end doors, and consist of a large rectangular platform mounted on flanged wheels that run on a track. Normally the movable platform, or truck, stands as a part of a larger platform adjoining a warehouse. The track on which it runs crosses a near-by switch track at right angles and the portions of the rails that lie directly on the switch rails are detachable, so that when not in use, they can be taken up and placed at one side. The outer ends of these rails are curved upward to prevent derailing of the truck. After a loaded freight car has been switched into place the movable platform is drawn up to the end of the car and the automobiles are rolled out on it one at a time. Each in turn is drawn over to the main platform and discharged upon it. It is claimed that a dealer saves several dollars per car by unloading in this way.



The Loaded Platform After It has been Rolled to One Side. The Rails with the Curved Ends may be Taken Up When Not in Use



The Movable Platform Placed at the End of a Freight Car from Which an Automobile is being Taken

¶A simple process has been found for converting kaing grass, which is abundant in Burma, into pulp for making paper.

FAMOUS FRENCH AIRMAN DIES IN ACCIDENT

One of the most distinguished airmen of France, Brindejonc des Moulinais, was killed in the vicinity of Verdun, June 20. According to the dispatches the famous flier was not engaged with, or attacked by, the enemy at the time, but his plunge to death was caused by some essential part in his machine giving way. Moulinais had been a member of the French flying corps since the outbreak of the war and had proven himself as skilled in warfare as his exploits had been spectacular in times of peace. Before the war he figured con-

spicuously in many flying events in Europe and won many honors. Perhaps his most memorable achievement was his circular flight over northern Europe in which he traveled approximately 3,000 miles. The feat was reported in Popular Mechanics Magazine at the time. He left Paris June 10, 1913, and visited in turn Berlin, Warsaw, Petrograd, Reval, Stockholm, and Copenhagen, returning to Paris July 2. Everywhere he was feted and received with great enthusiasm. He was the first to fly across the Baltic Sea, a feat incidental to this long trip.

PHOTO SHOWS BUILDING'S ESCAPE FROM LIGHTNING

The circuitous course of a stroke of lightning and how near it came to a building without hitting it are shown in a photograph taken recently in York, Pa. The camera which took this picture was set with open shutter facing a portion of the sky in which violent electrical displays were taking place frequently. The stroke that was registered on this particular negative, after leaving the cloud, followed a comparatively straight, though diagonal, course toward the earth until it came to about the level of some telephone wires, approximately 30 feet from the camera. There the spark turned to the right and struck a telephone post. It then leaped from the post toward a building close by, but instead of striking the structure it entered the ground about 1½ ft. from the post.

A Stroke of Lightning Which Came near Hitting the Building on the Right and Then Turned and Entered the Ground

SOUND DEFLECTOR PROTECTS CITY FROM FOG HORNS

At the Buffalo light station on Lake Erie a large deflector has been erected

The Big Deflector Backing the Fog Horns at the Buffalo Light Station on Lake Erie

behind the fog horns to protect the city from the deep, penetrating sounds of the powerful instruments when they are in service. The device is about 14 ft. in diameter and saucer-shaped. It consists of a steel shell having a 4-in. packing of mineral wool between it and a facing of asbestos board. The device is attached firmly to the roof of the building and forms a backing for the megaphones. When it became apparent that the city needed to be protected in some manner from the horns, the device was installed by the bureau of lighthouses. It has been in use for several weeks and is reported to have proved efficient not only in minimizing the volume of sound spreading back across the city, but also in rendering the signals more distinct to navigators.

LITTLE VICTIMS OF BLIGHTING SCOURGE

One of New York's Tiny Victims of the Plague. Little Tots from All Parts of the City Overtaxed the Local Hospitals during July and August. Scores of New Cases were Reported Daily, While About One in Ten of the Patients, Who Ranged from Mere Babies to Young Men and Women, Died

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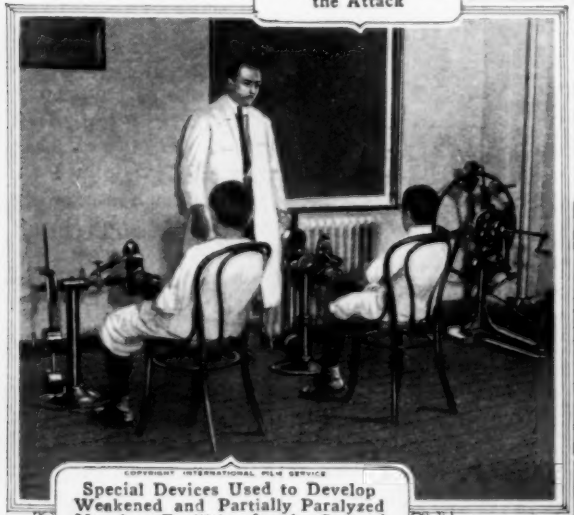
The Paralyzed Limbs of This Little Sufferer are Bound in Splints to Prevent as Much as Possible Their Deformation during the Attack

Applying Braces to the Limbs of a Little Girl before Discharging Her from the Hospital. Eventually, with Proper Care and Treatment, She will Probably Regain Her Strength. This Requires Time and Patience, However



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Special Devices Used to Develop Weakened and Partially Paralyzed Muscles: Facilities for the Care of 2,000 Patients are Needed at This, the World's Largest Orthopedic Institution

ARE TREATED BY HUNDREDS AT HOSPITALS

This Crippled Little Fellow, Just Recovering from a Severe Attack of Infantile Paralysis, is Surrendering a Quantity of His Blood so That It may be Used as a Serum with Which to Treat Other Child Sufferers of the Alarming Malady

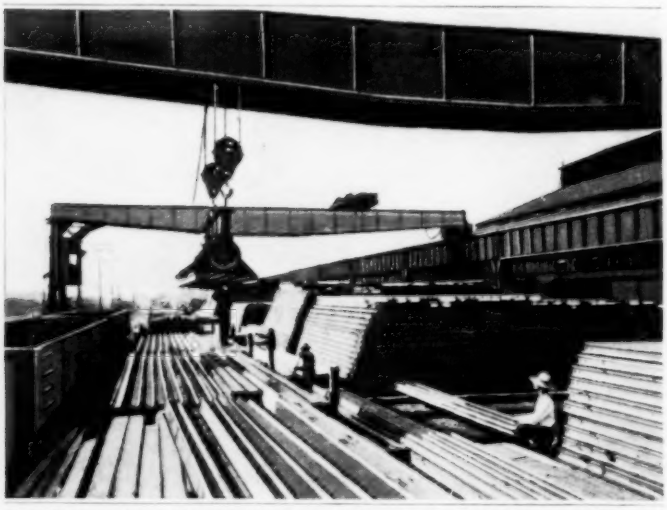
Map Showing Localities in New York Where the Epidemic Is Prevalent: As a New Case is Reported, a Pin is Added

While the Epidemic Was at Its Height, Row after Row of Small, White Beds in Isolated Wards Held the Pathetic Figures of Paralyzed Children

Massaging and Binding the Twisted, Wasted Limbs of Boy and Girl Sufferers of the Peculiar Disease, for Which No Cure has Yet been Found by Medical Practitioners. Only through Long and Expert Treatment can the Child Victims Fully Recover

LIFTING MAGNETS SIMPLIFY HANDLING OF RAILS

Although it cannot yet be said to be general practice, lifting magnets are coming to be used at rolling mills to facilitate the handling of steel rails. In the past flat cars were usually loaded by either swinging the rails into position with a sling, or by skidding them, one at a time, from the piles. The latter way is obviously the slowest and requires more labor than either of the others. The advantage of employing magnets, which are more commonly used for handling pig iron, is that time is saved and the labor charge lessened. Rails are transferred in the same orderly manner as when a sling is used, but without requiring irons to be passed beneath them or chains fastened. A couple of men can do the work of several in this way, and more quickly than when other facilities are employed. With the aid of magnets, gondola cars can be loaded just as easily as flat cars.



The Magnets Pick Up a Half Dozen Rails at a Time and Swing Them onto the Cars. This Picture Shows Them being Loaded Preparatory to Shipment Abroad for Military Purposes

SIMPLE OUTRIGGER BUILT FOR AIR-DRIVEN CANOE

On Great Herring Pond, at Bournedale, Mass., near Cape Cod Canal, a sportsman, who employs a motor-driven air propeller on his canoe, has constructed a simple outrigger that keeps the craft on a fairly even beam and does not materially retard its speed. The device is interesting chiefly because it is of a type that can be quickly put together by any man capable of using a saw and auger. It has two spruce bars loosely lashed across the thwarts. Bolts extended through streamline blocks hold a scow-shaped piece of light pine, forming an 8-ft. runner, to the far ends of the bars, which reach about three and a half feet to starboard. Since a liberal amount of play is allowed in the leashes, the outrigger readily follows the irregular surface of the waves, irrespective of the unequal displacements at bow and stern. In quiet water the craft makes a speed of from 10 to 12 miles an hour; with a stiff breeze, about 15 miles.

The Outrigger Keeps the Canoe from Listing without Materially Lessening Its Speed

PLAN FOR SHORTENING MISSISSIPPI RIVER TWO HUNDRED MILES

By M. F. JEFFERDO

THE author of this article is a civil engineer who has spent his time on public works for many years. His profession has called him to nearly every country in Europe, to China and Japan. He has examined rivers and waterways in Holland, Belgium, and China where the levee system is most extensively employed. His plan for handling the Mississippi River problem has unique and important features and is published now because of the widespread interest accorded our article on Flood Control in the August issue.—Editor.

EMINENT engineers have been working for years on the control of the waters of the Mississippi River, and have done well with the limited means at their command. The levee system as constructed and maintained has been of great value and bears witness of persistent and heroic service, all of which could be greatly strengthened by some comprehensive plan. Some fantastic propositions have been made by foreign engineers who are not at all familiar with this problem, and others who have simply looked at the map and guessed.

The levee system on the Mississippi River from Cairo to the Gulf of Mexico was intended to protect the cultivated lands adjacent to the river. This system has resulted in building up the bed of the river from year to year by reason of the fact that all of the tributary streams running into the Mississippi River have greater velocity, and consequently sediment brought into the main river, whose current is slower, is deposited in the river between Cairo and the Gulf. This is the main cause of the flood line going higher each year with a given rainfall.

Map Showing How the Silt-Bearing Waters of the Mississippi could be Diverted into the Atchafalaya River, Leaving the Old Channel a Clear Watercourse

Now, the most practical and cheapest remedy for this is to make a shorter outlet to the sea for this vast volume of silt-bearing water, and this outlet is via the Atchafalaya River, the source of which is near the mouth of the Red River where it empties into the Mississippi. The Atchafalaya River runs straight to the tidewater of the Gulf, a distance of about 100 miles, whereas, via the Mississippi River, the distance from the mouth of the Red River to the Gulf is 300 miles. The fall of the Mississippi River from the mouth of the Red River to the Gulf is about one-tenth of a foot per mile; of the Atchafalaya about three-tenths of a foot to the mile.

The increase in velocity from the mouth of the Red River to the Gulf via the Atchafalaya would probably lower the grade line of high water to two-tenths of a foot per mile, which would reduce the high-water line for that point (mouth of Red River) 20 ft. or more. This reduction in high-water mark would probably extend as far north as Memphis, or even Cairo; thus it can be seen that the levee as now built from Memphis to the Gulf would

be of ample height and strength to give safety to the adjacent country for probably a hundred years or more.

Would this improvement leave New Orleans an inland city? No. For the slowing down of the velocity of the water in the Mississippi from the mouth of the Red River to the Gulf via the old channels would result in all the sediment being carried to sea via the Atchafalaya, leaving the old channel a clear-water canal, which could be maintained at all times by a little dredging such as is necessary now at the jetties. The railroads entering New Orleans could then bridge the Mississippi River there and would profit in the long run by obviating the flooding of their tracks.

The jetties at the mouth of the Mississippi could be dredged to a depth of 40 to 50 ft. and remain so, for no sediment would be going out that way to fill them up. The high-water line at New Orleans would hardly exceed 10 ft. above low water.

The low-water line at New Orleans being only 1 ft. above sea level, with a depth of 50 to 60 ft. of water, it can be seen that not only would New Orleans be secure from floods in the future but that the largest vessels in the world could enter its harbor.

The Mississippi River, from the jetties to the mouth of the Red River, would be a canal, navigable at all times, with a little dredging, perhaps, between Baton Rouge and the Red River; and all that rich country on either side of the river from the mouth of the Red River to the Gulf would be absolutely secure from floods.

The country along the Atchafalaya River is mostly swamps, and the overflow of sediment-bearing water would, in a few years, fill up the swamps, making it one of the richest agricultural districts in the world, not even excepting the valley of the Nile.

It is estimated that this improvement would reclaim and make available for constant and safe occupation at least 12,000,000 acres of land that is now principally mud and malaria. Contemplate the immense possibilities there! This area of rich alluvial soil produced and developed would support an enormous population.

Conservation and reservoir systems to hold back the flood waters would be expensive and futile; nor would the levee system avail for any great length of time, by reason of the fact that so long as the Mississippi River runs through its present channels to the sea, the slowing down of the current causes the sediment brought from the tributary streams to deposit within the wet perimeter of the lower river, building its bed between the levees higher and higher each year. The immense volume of water at flood seasons is choked in its flow to the ocean by being forced through the small end of a funnel, as it were—the jetties at the mouth of the Mississippi River.

AERIAL PASSENGER FERRIES OPERATED IN EAST

At Newport News aerial passenger service is being maintained by a regularly organized aeronautical transportation company. At fixed rates travelers are carried by aeroplane or flying boat to almost any destination they may wish to reach. For fees, ranging from $20, for a one-way passage to Norfolk, to $1,250, for the round trip between Newport News and New York, connections are made with various cities along the Atlantic seaboard, including Jamestown, Richmond, Washington, Baltimore, Philadelphia, Atlantic City, and Asbury Park.

Large, stanch machines capable of carrying two or three persons in addition to the pilot, as well as small, speedy craft with accommodations for only a driver and one passenger, are employed. The company's base depot at Newport News, where its hangars are situated near the water's edge, has become a great local attraction. Hundreds of sight-seers flock by trolley and motor to the site and watch the arrival and departure of the aerial ferries.

To many the schedule of fares, painted at the upper part of a bulletin board fixed to the exterior of the depot,

Glimpse within the Hangars, Showing the Nose of One of the Big Flying Boats Which Carry Several Passengers on Regular Trips

One of the Aerial Transportation Company's Swift Biplanes Setting Out from Newport News Aeronautical Depot with a Passenger Bound for Some Coast City

ATLANTIC COAST AERONAUTICAL STATION
SCHEDULE OF AERIAL FARES

NORFOLK	$35.00	"	$20.00
JAMESTOWN	$5.00	"	$4.00
RICHMOND	$20.00	"	$15.00
WASHINGTON	$50.00	"	$37.50
BALTIMORE	$50.00	"	$37.50
PHILADELPHIA	$75.00	"	$60.00
ATLANTIC CITY	$80.00	"	$60.00
ASBURY	$100.00	"	$75.00
NEW YORK	$250.00	"	$100.00

ALTITUDE FLIGHTS & SPECIAL TRIPS TO ALL POINTS

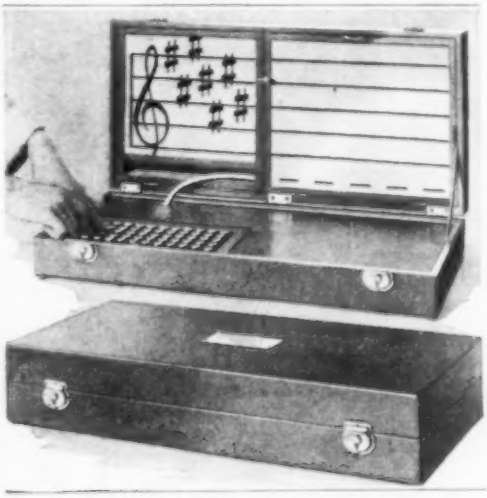
Fares Asked for Aerial Transportation to Various Points

Large Crowds of Sight-Seers Flock to the Depot to Witness the Arrival and Departure of the Winged Ferries of the Air

is as amazing as the innovation itself. The interesting thing, however, is that an aerial transportation system, dreamed of by scientists and fiction writers for generations, has actually been established in America, and is operated in almost as deliberate and businesslike a manner as if it were a commonplace institution of years' standing. The service is advertised in street cars and newspapers much the same as are railway and steamship lines.

ELECTRIC DEVICE ASSISTS IN STUDY OF MUSIC

Some attention has been attracted in music circles to the odd invention of an electrical-engineering student at one of the Indiana universities. The device, on which patent rights are pending, is designed for applying the word-sentence-phonetic method of language instruction to the elementary study of music. It is called by its originator the "music optigraph," and, by means of keys connected with small incandescent lamps arranged behind a celluloid or other transparent screen on which staff lines are printed, any combination of notes from two to five within the range of an octave and a half can be flashed before a pupil. The purpose is to assist the beginner in learning to recognize at a glance whole phrases or motifs, instead of reading note by note and losing rhythm and meaning. In brief it is hoped to train children through the medium of the apparatus to think a music or tone

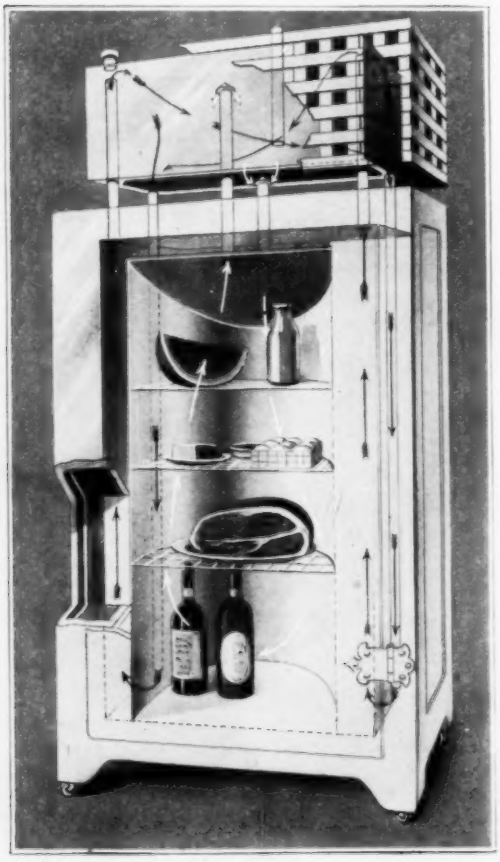


By Touching Various Keys, Different Combinations of Notes are Flashed before the Pupils. The Apparatus is Used in Connection with the Phrase-Motif System of Music Instruction and is Intended to Assist a Child in Learning to Read and Enjoy Written Music in the Same Way That One Reads and Absorbs the Meaning of a Printed Page

vocabulary so that they can acquire the faculty of reading music in the same way that one reads a printed page. The "optigraph" is being used by the director of the music department at a state normal school in Wisconsin who for some years has, with the aid of printed cards, employed the so-called phrase-motif system of instruction. The instrument weighs about 15 pounds and is contained in a mahogany case, less than two feet in length and about a foot wide.

ICELESS REFRIGERATOR COOLED WITH BRINE

An iceless refrigerator which is kept cool by brine is now being manufactured for use on the Pacific coast and in other regions where the nights are sufficiently cool to make the invention operate properly. The food chamber of this device is surrounded on three sides by brine tanks, outside of which is heavy insulation; between the latter and the outside wall is an air space. Situated above the cabinet and connected with it by pipes, is another brine tank inclosed in latticework. On a cool night the brine in the exposed tank becomes thoroughly chilled and gradually displaces the warmed fluid below. The pipes carry the warmed brine into the top of the upper tank and the cooled brine into the bottom of the lower tanks. Similarly arranged air pipes connect the interior of the refrigerator with an air chamber inside the upper tank and so keep the food chamber dry and sanitary.



A Brine-Cooled Refrigerator Designed for Use in Regions Where the Nights are Sufficiently Cool to Chill the Brine in the Exposed Tank above the Food Chamber

BUMPS SERVE AS CROSSING WARNING FOR MOTORISTS

Harassed villagers have been known successfully to check automobile speeding on their village streets by constructing bumps in the highways at frequent intervals, but now the same method is being used primarily as a protection for the speeder himself. In Memphis, Tenn., for example, the park commissioners have placed bumps of this sort not far from a dangerous railroad crossing, over which motorists are inclined to pass at high speed. These checks are about 6 ft. wide at the base, 2 ft. wide at the top, and are placed 50 ft. from the track. A sign still farther from the crossing warns drivers to go slow. Los Angeles is another city which is experimenting with checks of this sort as preventives of accidents at grade crossings. Another device, which is not installed at such low cost, is a stretch of deep sand, which forces all motors to run slowly when passing over it. Both the bumps and the sand stretches serve to give a driver more time to look out for approaching trains. Abrupt depressions cut in the roadbed have been suggested to perform the same service, but they are not regarded as practical.

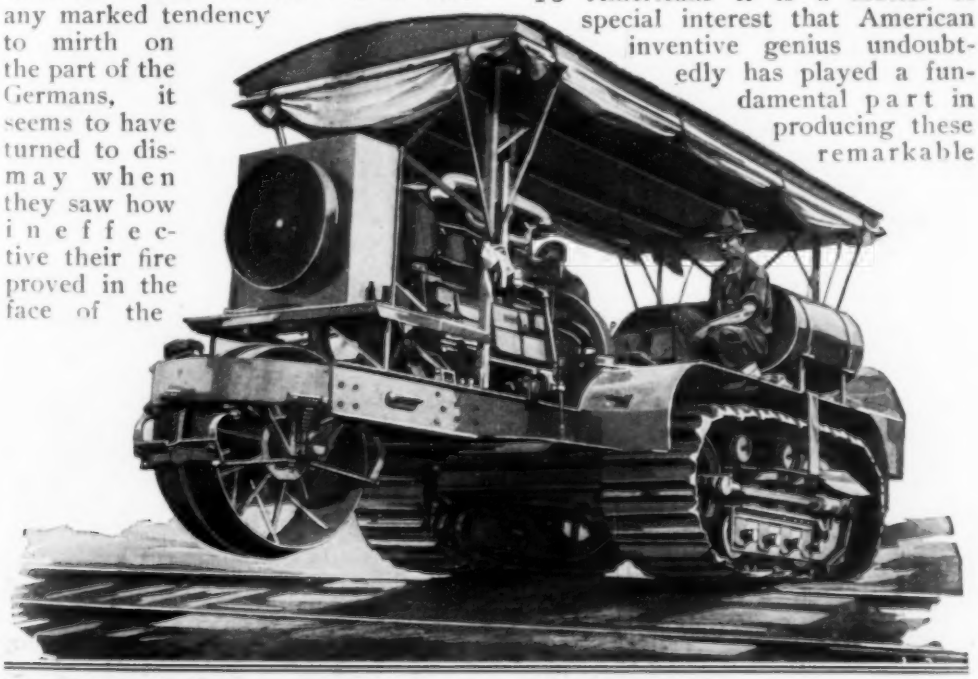
"TANK CARS" SMASH GERMAN LINES

American Ingenuity Shares in Producing New War Engine That Leads Spectacular Advances for Great Britain

By JOHN ANSON FORD

THE sudden appearance of what have been called "tank cars," on the British front the third week in September, added another spectacular feature to modern war methods, which already have been characterized by so many new and deadly devices. These strange cars, which it appears the British have been secretly equipping for weeks, crossed trenches and made their way through shell craters without difficulty. Each is covered with heavy armor, within which are gunners that keep up a heavy fire when the enemy is within range. In fact, the new machines proved so effective on the very first day, that the attack which they led enabled the infantry to break through the Germans' third line of defense. These traveling forts are described as lumbering along over uneven ground in a fashion that is almost ludicrous. But if there was at first any marked tendency to mirth on the part of the Germans, it seems to have turned to dismay when they saw how ineffective their fire proved in the face of the thick armor. One car, at least, triumphantly returned to its base leading a column of prisoners. Some of the feats of these machines, as told by reliable observers, are truly astonishing. At one point, for example, a "tank" drove its nose into a stone or brick wall, but it only paused an instant, as if leaning hard against it. Then the barrier fell and the machine clumsily climbed up over the debris and continued on its way, all the time keeping up a deadly fire. However, some of the cars met with disaster, even in the first carefully planned assault. One was overturned in a shell crater and, in spite of its crew's heroic efforts, could not be righted. Another stood far in advance of the infantry for several hours, firing into the German lines, and then was abandoned because it had been badly damaged.

To Americans it is a matter of special interest that American inventive genius undoubtedly has played a fundamental part in producing these remarkable



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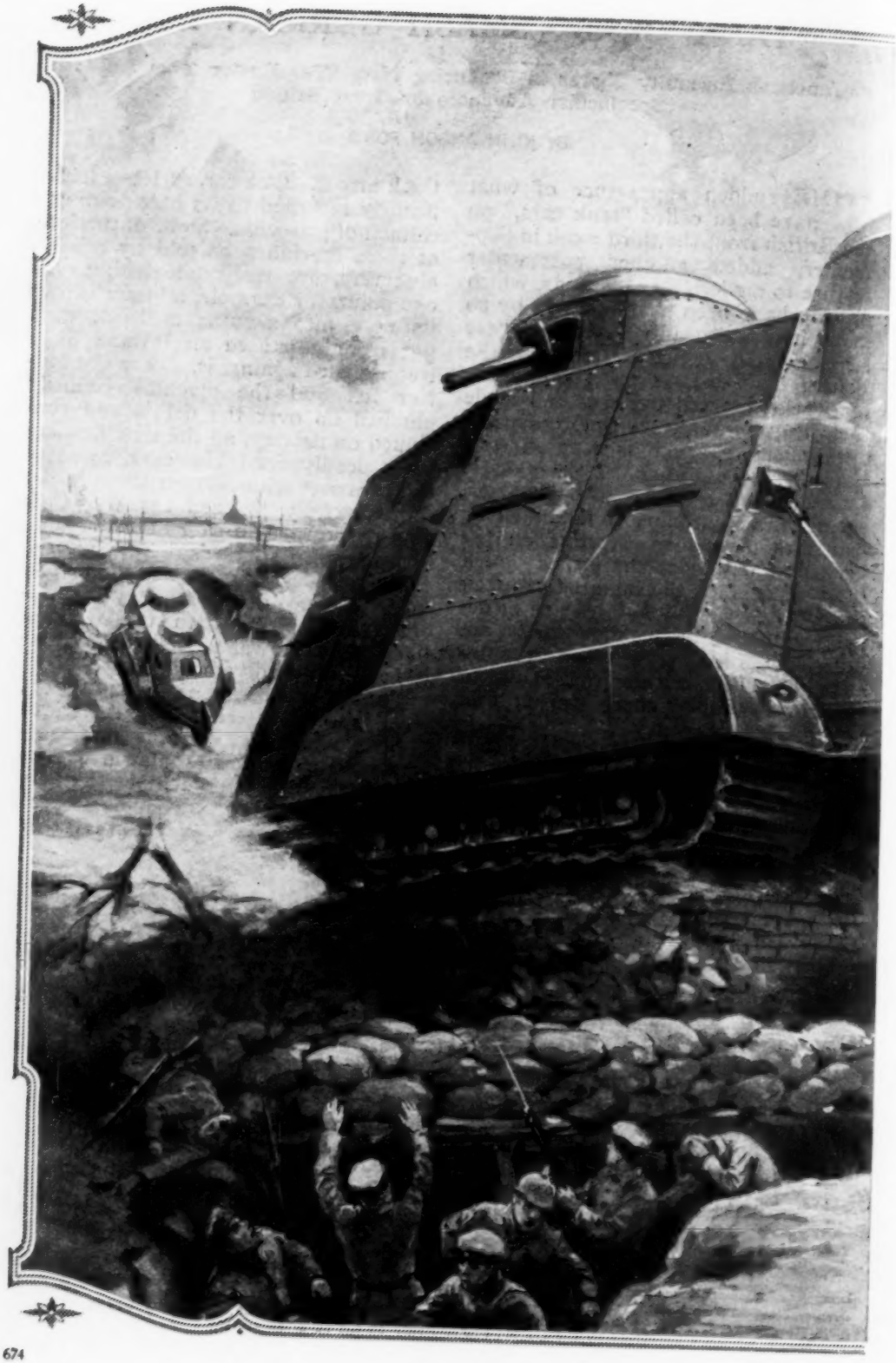
A 75-Horsepower Tractor of the Caterpillar Type "Jumping" a Railroad Track: This Is One of the Machines Used by the United States Army on the Mexican Border

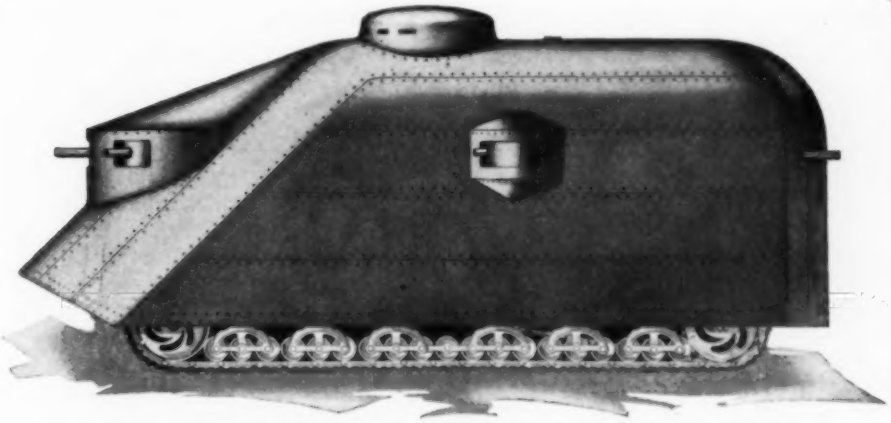


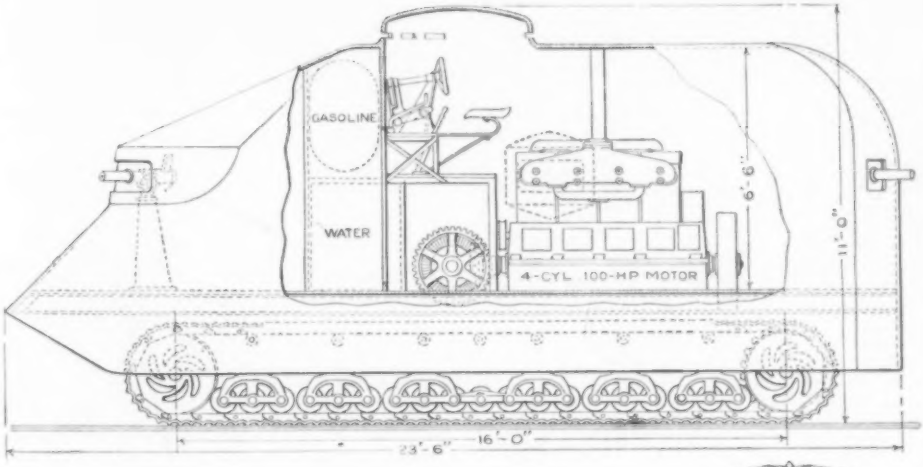
POWERFUL British "land battleships" advancing upon the German defenses in France across the desolated "No Man's Land," scarred with deep shell craters and demolished trenches: These lumbering, steadily advancing monsters of war are shown snapping off trees and demolishing walls as they progress. As the machine in the foreground pushes its prow across the German trench the gunners within the armored shell begin cross fire that sweeps all before it. Machine guns and other trench weapons are powerless before these strange engines of destruction. The conception which the artist presents herewith is based on reliable data and photographs of tractors of the caterpillar type which are very similar to those that Great Britain has purchased from American firms and which, according to first-hand reports, have been equipped with armor. The marvelous ability of these cars to ascend or descend steep declivities is well shown by the tractor in the background.

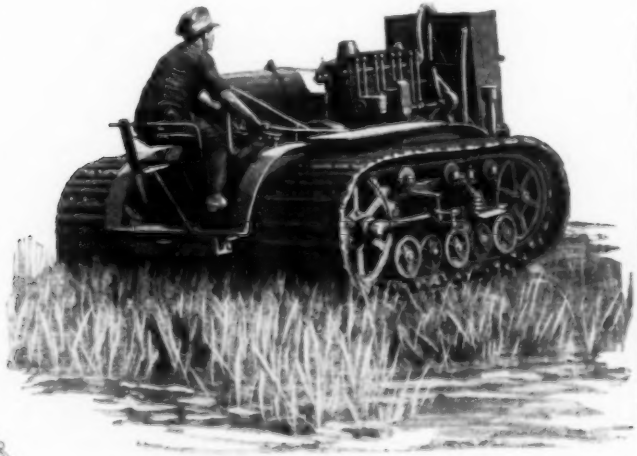
cars. There is little doubt that they are powerful gasoline tractors of either the caterpillar or the alligator type, which have been covered with armor. Within recent years firms in this country have evolved these masterly machines for large-scale farming, big lumbering projects, and the like. Later they demonstrated their military value in a convincing manner. One manufacturer has shipped 1,000 tractors of the caterpillar type to England within recent months, and reports received by the concern since then have indicated that some of them, at least, were being equipped for actual fighting. Another American concern some time ago prepared complete plans for an armored car of the alligator type, patterned after machines that are extensively used for logging in the western forests, and submitted them to the British authorities. The plans were under consideration for a time and then the matter was dropped. It is the belief of this concern that the features of the car it designed have been appropriated in whole or in part by the British government, and that Great Britain is unfair in claiming the credit for these war monsters.

The distinctive feature of the caterpillar car is that it is supported by a single wheel at the front and two wide endless tracks, or belts, of the caterpillar type near the rear, one on either side. Fastened to the inner side of these tracks are endless rails on which rest small trucks that support the engine. Each broad corrugated track passes around two big cogwheels which cause it to travel forward or backward. These corrugated rear supports in some instances have a bearing surface nearly 7 ft. long. The alligator car, however, has no forward wheel and travels entirely on two endless corrugated belts, each of which has a bearing surface of 16 ft. and can be operated independently of the other. The design of the tractor of this type, which was submitted to the British officials, provided for an armored tractor which is 23½ ft. long, 11 ft. high, and 10 ft. wide. A 100-hp. engine is situated just back of the center of the car. The two belts which give the machine such extraordinary ability in climbing inclines, crossing trenches, etc., are equipped on their inner surface with endless rails somewhat like the caterpillar type of belt. These alligator cars are supported by six small trucks on each side, inclosed within each belt. Projecting through the armor of these traveling monsters are seven rapid-fire guns, three at the front end, one at either side, and two at the rear. From the dimensions given it is apparent that a large crew of men can be carried in these cars, as well as large quantities of ammunition. The driver's seat is situated above a platform just in front of the engine, and is elevated so that he can look out through narrow slits in the heavy armor that is shaped into a low flat dome above him. The steering wheel, levers, and other controlling devices, are arranged somewhat the same as on a truck of the ordinary type.

The astonishing manner in which the British "tank cars" have been able to cross trenches, overturn stone walls, and perform other feats is doubtless made possible by these corrugated tracks, or belts. In the case of the cars of the caterpillar type having tracks with 7 ft. of bearing surface, it has been possible for them to crawl across practically any gap which was less than 7 ft. wide, while the alligator cars, with a bearing surface 16 ft. long, can negotiate gaps and overcome obstacles which in some repects are even more difficult. Marked success has attended the use of tractors of the caterpillar type by the United States Army on the Mexican border for hauling, etc. One of these machines which carries neither armor nor arms, weighs nearly 14 tons. It has a drawbar pull of 11,000 lb. and is equipped with a 75-hp. engine. The alligator type of car is steered by operating one belt faster than the other. The caterpillar type of car can be steered this way or by using the front wheel.







THE upper illustration, together with the diagram, gives a very clear idea of the 100-horse-power alligator cars, plans for which were considered by the British government and which are believed to have been copied, at least in part, in constructing the "tank cars" that have done such effective work at the front in France. Each of the corrugated belts on which this "land battleship" moves forward, regardless of trenches, shell craters, or walls, is two feet wide and has a bearing surface 16 feet long. Seven rapid-fire guns are so situated as to give protection to all four sides. By operating the belts separately the car can be turned about in quite small compass. The illustration at the left shows a car of the same type, though smaller, without any armor, and gives an excellent idea of the construction.

REVOLVING DRUM TESTS STRENGTH OF BOXES

One of the seemingly very simple things of which the United States Forest Service is making a most profitable scientific study is the manufacture of

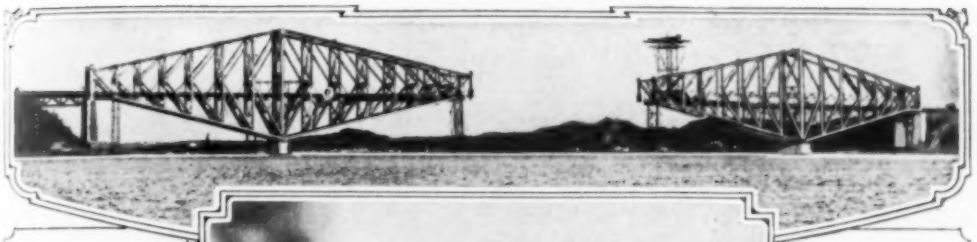
A Machine Recently Constructed for the Forest Service with Which It Tests Durability of Various Types of Boxes and Shipping Cases

wooden boxes of various sorts. The study is not theoretical but involves accurate tests, which are made in a big hexagonal drum in which the containers to be tested are placed and revolved. This box-testing machine has been completed only recently. At various points on the inner surface of its six sides, which are each 3½ ft. wide, scantlings have been bolted. Boxes to be tested are packed with cans filled with water and placed in the machine. As it revolves these scantlings serve as baffles and the boxes are knocked about with considerable violence. A meter indicates the number of revolutions made. The whole idea of the Forest Service in this work is to prevent losses in shipment, which admittedly are great at the present time. This can be done, it is believed, by making boxes more substantial, though not necessarily requiring more or better lumber.

CENTRAL SPAN OF GREAT QUEBEC BRIDGE FALLS

Unexpected accident delayed the completion of America's greatest structural project—the Quebec bridge—when on the afternoon of September 11, the central span, which was being raised into place by hydraulic jacks, slipped from the stirrups that held it and fell into the water. The exact cause of the disaster, which cost the lives of nine workmen and a money loss to the contractors of over half a million dollars, is still the subject of investigation, though a well-supported theory regarding it has been advanced. The accident is the second to befall in the spanning of the St. Lawrence River at this point. In 1907, after years of labor, practically half of the main span of the bridge then being built fell through failure of a lower chord member of the cantilever arm. At that time some 90 men were killed and the loss was approximately $8,000,000.

To understand something of how the second accident occurred it is necessary to explain briefly the novel method employed in raising the span that fell. The span was 640 ft. long, weighed over 5,000 tons, and was intended to connect the great cantilever arms that project from their anchors toward the center of the stream, their ends being 150 ft. above the water. The connecting link was towed on scows to a point just beneath the gap and its ends were placed on big steel stirrups, one at each corner. The two "chains" of each stirrup were composed of steel bars, or links, each link being a solid plate, 30 ft. long, 30 in. wide, and 2¼ in. thick, bored at intervals for 12-in. pins. Two 1,000-ton jacks, at the upper ends of each of these four sets of chains, raised the immense load, 2 ft. at a stroke, a distance of about 15 ft., when something went wrong and in an instant the work of years was destroyed. The span sank out of sight in 200 ft. of water. It is now believed that the defect existed at one of the points where the span rested on rocker bearings, which in turn transferred the weight to the



Above: The Huge Cantilever Arms of the Quebec Bridge, Showing Part of the Apparatus for Lifting the Central Span, Hanging from the Ends

Below: A Remarkable Photograph Taken at the Instant the Span Plunged into the Water. The Crumpling of the Structure is Clearly Shown

The Completed Central Span, 640 Feet Long and Weighing Over 5,000 Tons, Before It was Moved on Scows to a Point beneath the Cantilever Arms

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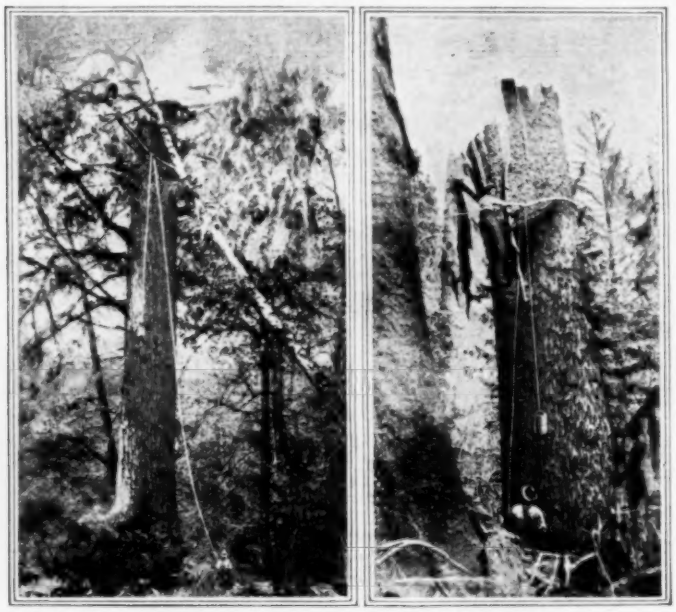
cross girders of the stirrups. In the opinion of engineers, one of these bearings was fractured. This shifted the weight, leaving stirrups at diagonally opposite corners free to slip from under their load, whereupon the span crumpled and fell. A remarkable photograph of the plunge is shown herewith.

It is interesting to note that well-known experts, who have carefully studied the means used to lift the span, still assert that the method is a correct one. The builders have announced that they will complete the bridge in spite of the two disasters. It seems probable that the same means will be employed in erecting the new span, though it may be two years before that member can be completed. In one respect the accident has given cause for congratulation, for it proved the ability of the great cantilever arms to withstand extraordinary stress. The weight of the span which was placed upon the arms gradually deflected the ends 9 in. Then the load was suddenly dropped, but in spite of this almost instantaneous release, the consequent springing back of the arms, and other undue strain, they were apparently undamaged.

FIGHT FIRES IN TREE TOPS HIGH ABOVE GROUND

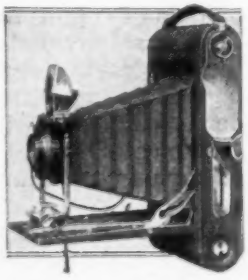
Rangers patrolling a valuable tract of timber in Washington State were recently called upon to combat a rather peculiar forest fire that had gained considerable headway before being discovered. The tops of a large number of trees were afire when the alarm was sounded. During May a slash burning had been made on his property by a settler, and although it was thought to have been entirely extinguished, it came to life a long time later in the midst of a dry spell. Wind blew sparks into inflammable moss covering the crowns of many of the trees, and the fire started. When the rangers reached the scene before daybreak one morning, they formed a bucket brigade. A man would climb 80 or 90 ft. up one of the burning trunks and by means of a rope lift buckets of water as rapidly as they were filled by helpers on the ground below. In this way, with but a bucket of water at a time, work continued for three days. In some instances it was necessary to fell a tree to extinguish its fire, but 60 of them were climbed, and saved by quenching the fires with water.



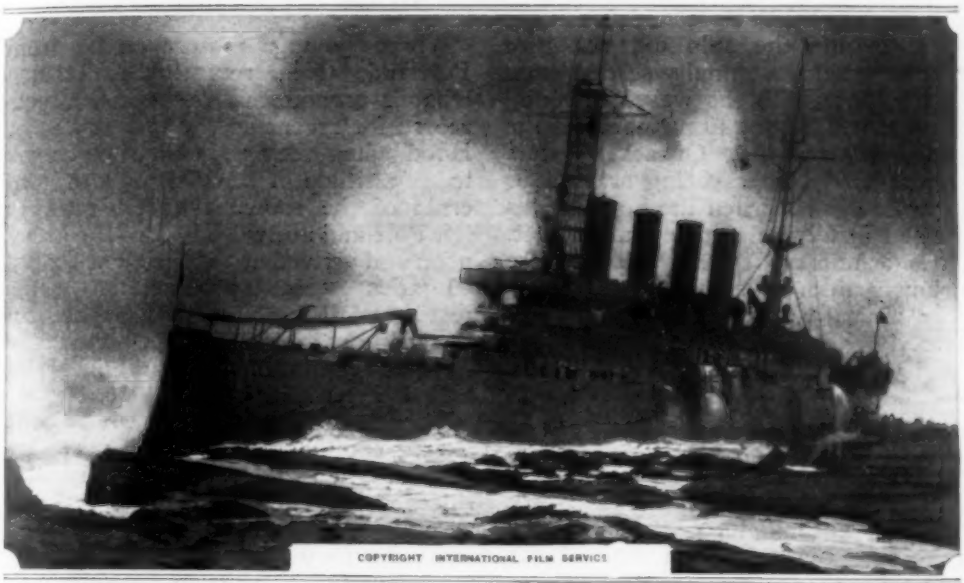
Left: Clinging in the Branches of a Burning Tree 95 Feet above the Ground and Drawing Up Pails of Water with Which to Quench the Blaze. Right: With the Aid of a Maple Hoop and Spurs, the Ranger Scaled This 40-Foot Spruce Snag and Extinguished the Fire in the Same Manner

ATTACHMENT WINDS CAMERA FILM AND LOCKS SHUTTER

With an attachment for a camera, which has been invented by a resident of Kansas, pictures can be taken in very rapid succession, thereby enabling one to get snapshots which otherwise would be lost while winding up the film. Furthermore the attachment makes double exposures impossible. Simply by pressing a lever the film is wound up the proper distance. This lever projects from the side of the camera through a narrow slot situated just below the handle ordinarily used in winding the film. All that is necessary is to press the lever down from the upper to the lower end of this aperture. By means of an ingenious flexible connection, which extends from the winder to the shutter, the latter is automatically locked after each exposure and will not unlock until the film has been turned. This device eliminates the uncertainty often arising with an ordinary camera as to whether the film has been turned or not.



TROPICAL STORM SWEEPS CRUISER ONTO ROCKS



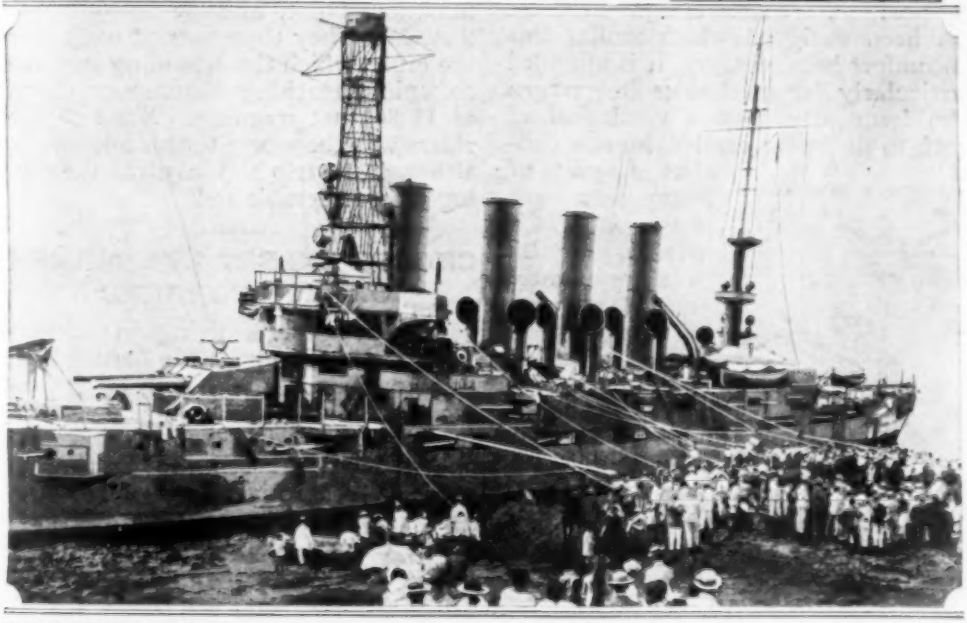


PHOTO BY UNDERWOOD & UNDERWOOD

With Great Rapidity the "Memphis" was Carried Shoreward and Hurled onto the Rocks, Where It Settled with the Waves Breaking over It. The Upper Photograph Is so Rare a One That It Deserves Special Notice. It Shows the Fighting Vessel Actually Going onto the Rocks and the Sailors Lining Its Decks. The Lower Picture was Taken on the Following Morning While the Lines, on Which the Men Reached Shore, Were Still in Place

Near the close of summer the United States armored cruiser "Memphis" was driven by a tidal wave onto the rocks at Santo Domingo and wrecked. The disaster occurred late in the afternoon in the midst of a tropical storm of terrific intensity. The vessel was well out from shore and appeared to be in no danger. Then, according to an eyewitness, it "commenced to come

toward the shore by leaps and bounds, thrown like a toy by the enormous waves. By the most extraordinary good fortune the ship did not turn over or break, but finally settled close to the shore with the waves breaking far over it." About 40 members of the ship's crew were lost. Of these, 34 were drowned, the others being scalded or burned to death when the bottom was crushed in by the tremendous impact. Quite a number of the sailors were seriously injured, some of them possibly mortally. The "Memphis" was formerly the "Tennessee."

HEADREST FOR AUTOMOBILE MECHANIC FASTENS TO CAP

Not the least of the discomforts attendant upon doing repair work under an automobile is the necessity of holding one's head in a most tiring position. A simple, light headrest has been designed which makes this discomfort unnecessary. It is intended particularly for mechanics in garages who frequently have a good deal of work to do under cars. The rest consists of a piece of heavy wire bent in the shape of a rounded "U." Its ends are slightly hooked and can be caught in holes provided at the ends of a curved aluminum band about 5 in. in length. This band is intended to be sewed to the back side of a cap. Whenever one desires to use the headrest he simply attaches the curved wire to the band on his cap and he has a device which is not in the way and which is always in position, no matter how much he moves about under the car. The part of the rest that comes in contact with the floor is bound with rubber to prevent its slipping.

RECORD CLIMB UP MOUNT HOOD ON MOTORCYCLES

Three young motorcyclists from Portland, Ore., recently established what is pronounced a new motorcycle record for ascent up the side of Mount Hood when they rode their machines to an altitude of 9,000 ft. on the hard crust of the snow. The adventurers left Portland at five o'clock in the afternoon and arrived at Government Camp, 60 miles away, that evening. After resting until 2 A. M., they pushed on toward Emergency Camp, which is right at the foot of the mountain. The actual ascent began at 5:15 A. M. while the crust of the snow was still strong enough to bear them up. Occasionally, as the grade steepened, the riders were spilled in the snow and had to pull themselves and their machines out. But they reached their goal, Illumination Point, altitude 9,000 ft., at 9 A. M. They then hurried back over the crust, which the ascending sun was softening, reaching Emergency Camp at 11:30 that morning. None of the riders was the worse for his adventure, although the trip had involved the taking of considerable risk.

CHOOSE EXPERT LUMBERMEN FOR TRIP TO EUROPE

Lumber experts living in various parts of the country have been taking examinations recently with a view to securing appointment as members of a lumber commission of five which the government will send to Europe to make an exhaustive study of the lumber situation across the Atlantic. These experts will make estimates of timber stands in all the European countries; they will study the means employed to insure a steady lumber supply in the future, the cost and methods of logging, the methods of selling and delivering the finished products, and also the general competitive power of the various countries. The first examinations given were written and were to be followed by oral examinations held in Washington.

RARE VIEWS FROM FRENCH AND GERMAN LINES

Doubtless the Most Stirring and Realistic Picture of Action and Fighting Spirit so Far Passed by the Censors: Companion Print of One Reproduced in the May Issue of This Magazine. It has been Awarded First Honors at the Paris War Photographic Exposition, and Shows Frenchmen Trapped in a Ruined Alsatian Village Fighting to the Last Man. The Officer at Left is Falling; the Wounded Man in Middle is Handing a Comrade His Remaining Cartridges

Herewith Is a War Photograph That Needs but Little Explanation, for It Is so Striking That It Tells Its Story without the Assistance of Many Words. The Picture was Taken in the Village of Fleury, near the Verdun Front, Following One of the Many Engagements in That Sector. The Bodies Are Those of German Soldiers Lying Just as They Fell. The Background Indicates the Devastated Condition of the Town

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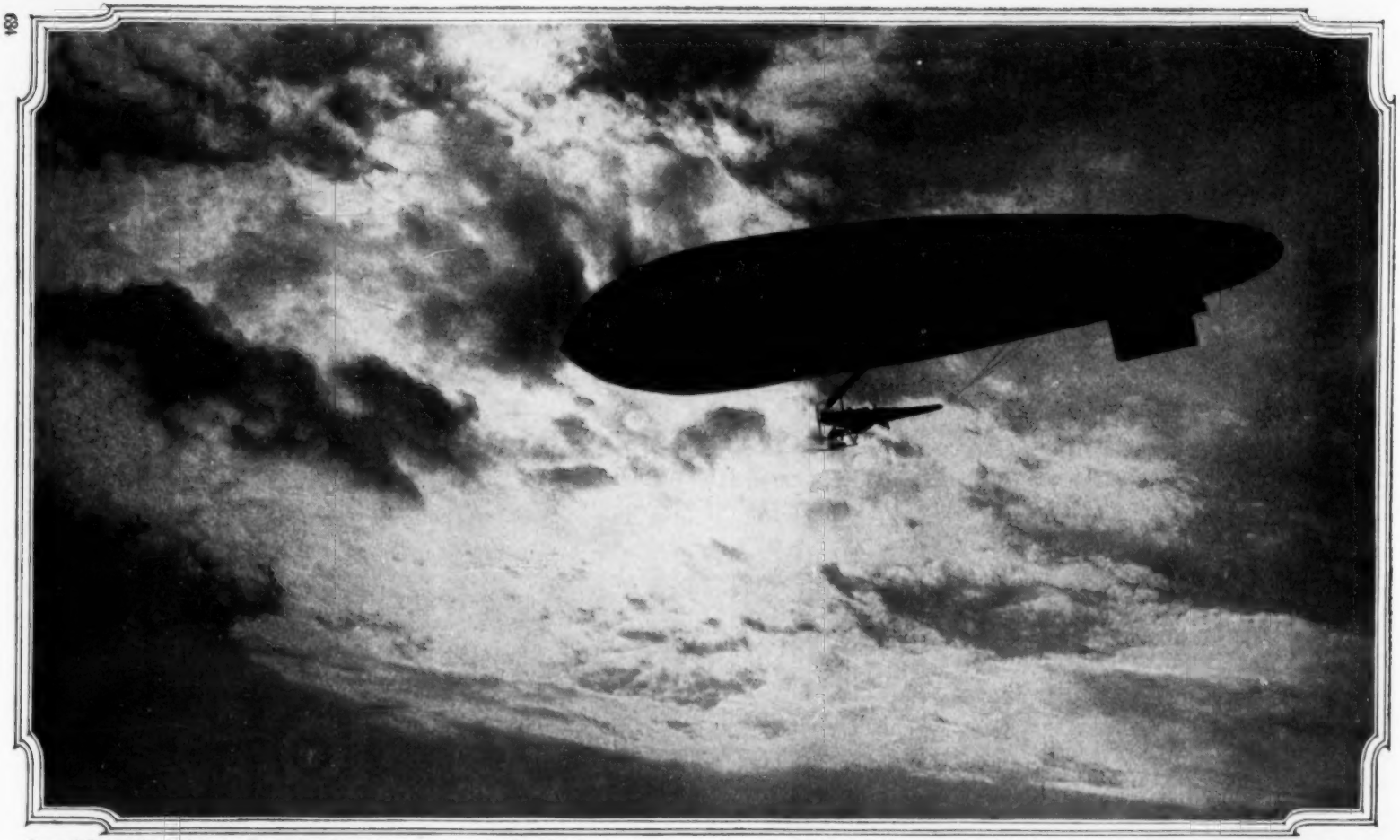
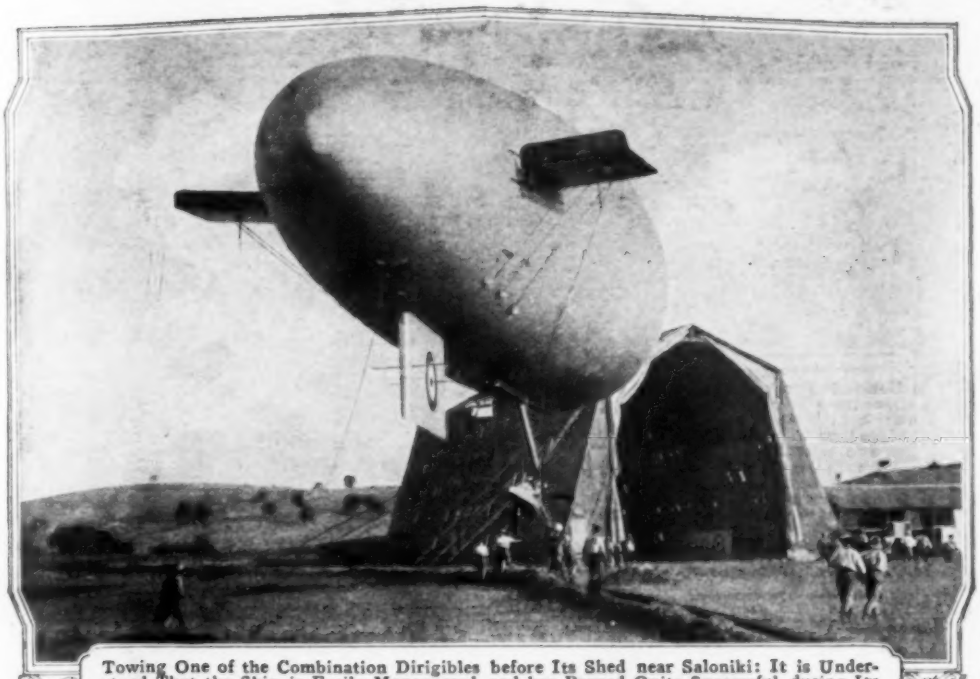
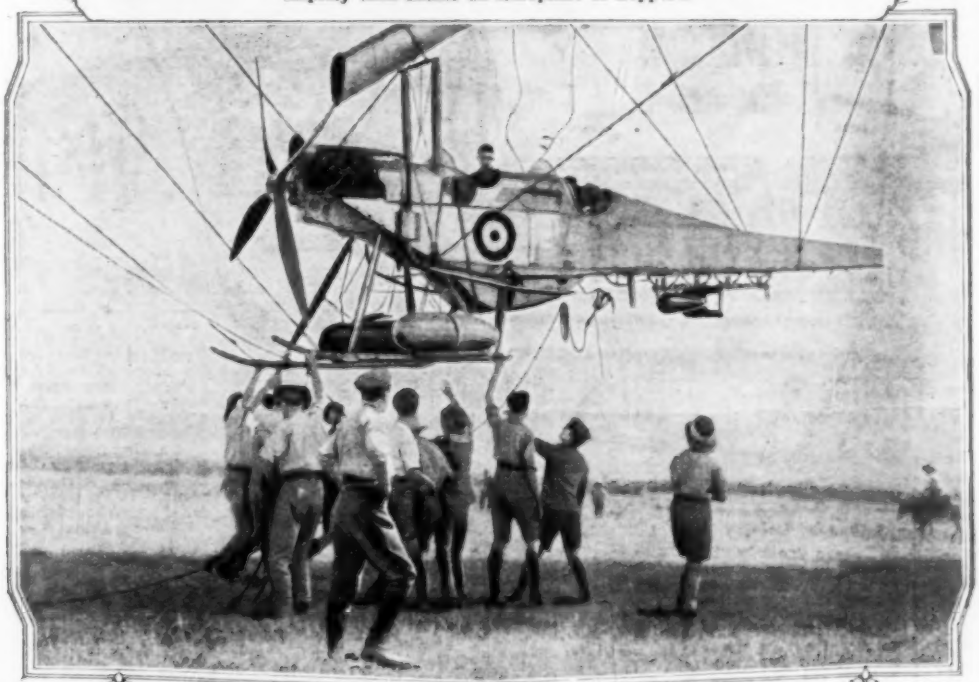


One of Britain's Odd Naval Scouting Dirigibles Cruising in the Vicinity of the Ægean Sea. The Machine is Seen Outlined against the Western Sky near the Close of Day. The Gas Bag Is of the Semirigid Type and Carries the Rudder and Elevators Used in Steering. The Aeroplane Body Suspended Below Mounts the Motor Which Propels the Craft and Forms a Light and Efficient Car. Aeroplane Fuselages Simplify Dirigible Construction as They are Built in Number, and Are Readily Obtainable

FIRST VIEWS OF BRITISH AEROPLANE DIRIGIBLE

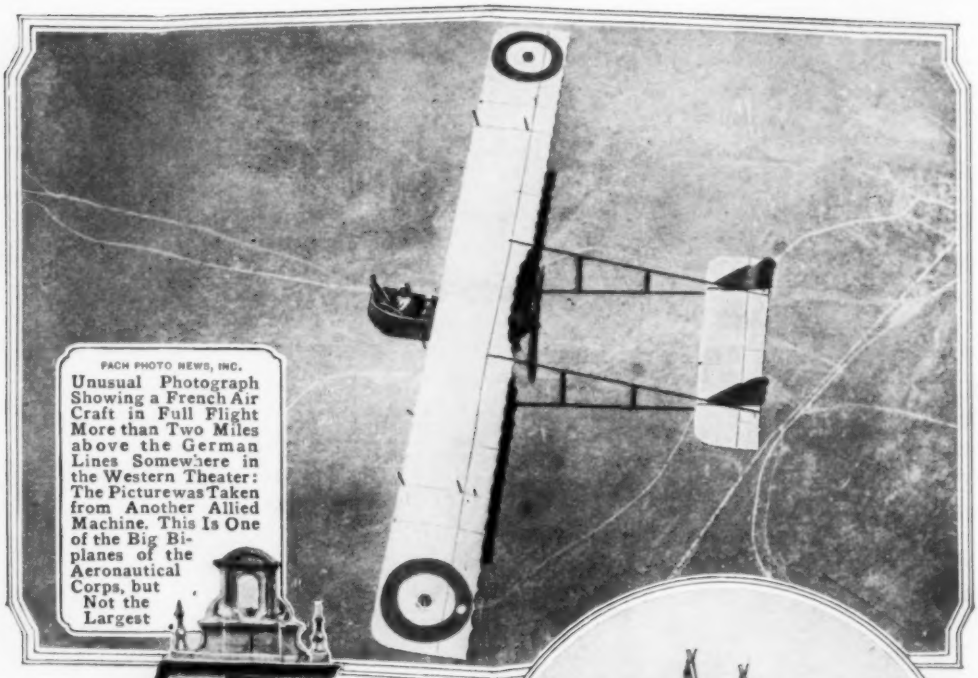


Towing One of the Combination Dirigibles before Its Shed near Saloniki: It is Understood That the Ship is Easily Maneuvered and has Proved Quite Successful during Its Several Months of Service on Different Fronts. It is Said to Be Able to Climb More Rapidly than Either an Aeroplane or Zeppelin



Bow View of Novel Craft, Showing the Aeroplane Body Suspended beneath the Semirigid Gas Bag. It will be Observed That Pontoons have been Fastened to the Skids to Permit the Machine to Alight on Water, and That High-Explosive Bombs are Carried on the Under Side of the Aeroplane's Tail

WAR'S AERIAL PHASES FROM ALLIED VIEWPOINT



PACH PHOTO NEWS, INC.

Unusual Photograph Showing a French Air Craft in Full Flight More than Two Miles above the German Lines Somewhere in the Western Theater: The Picture was Taken from Another Allied Machine. This Is One of the Big Bi-planes of the Aeronautical Corps, but Not the Largest

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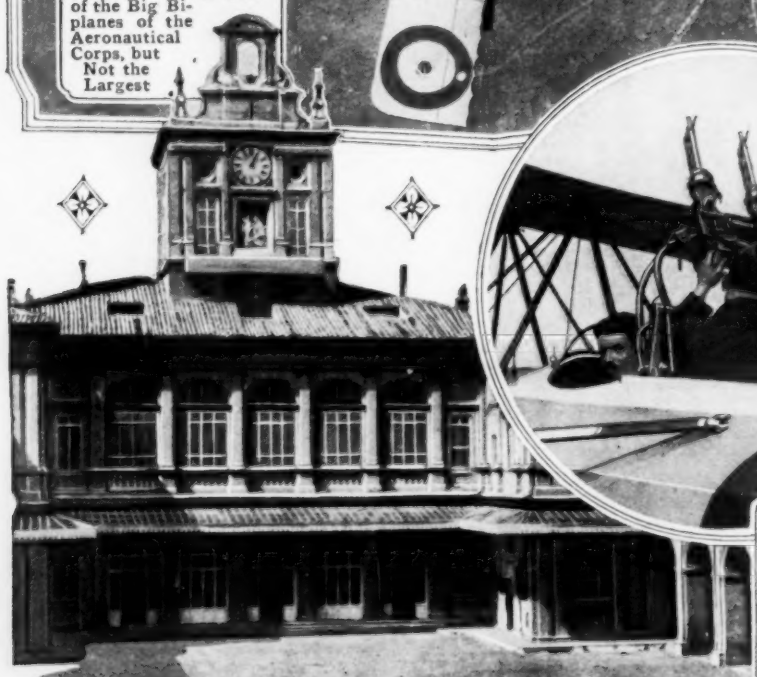
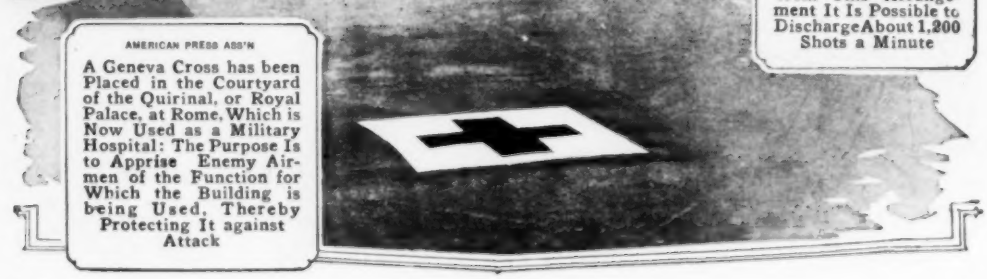
Two Machine Guns are So Mounted in This French Reconnaissance Plane That the Observer Is Able to Aim and Fire Both of Them Simultaneously in Repelling an Attack. With This Arrangement It Is Possible to Discharge About 1,200 Shots a Minute





AMERICAN PRESS ASS'N

A Geneva Cross has been Placed in the Courtyard of the Quirinal, or Royal Palace, at Rome, Which is Now Used as a Military Hospital: The Purpose Is to Apprise Enemy Airmen of the Function for Which the Building is being Used, Thereby Protecting It against Attack

SIDE LIGHTS OF WAR PICTORIALLY TREATED

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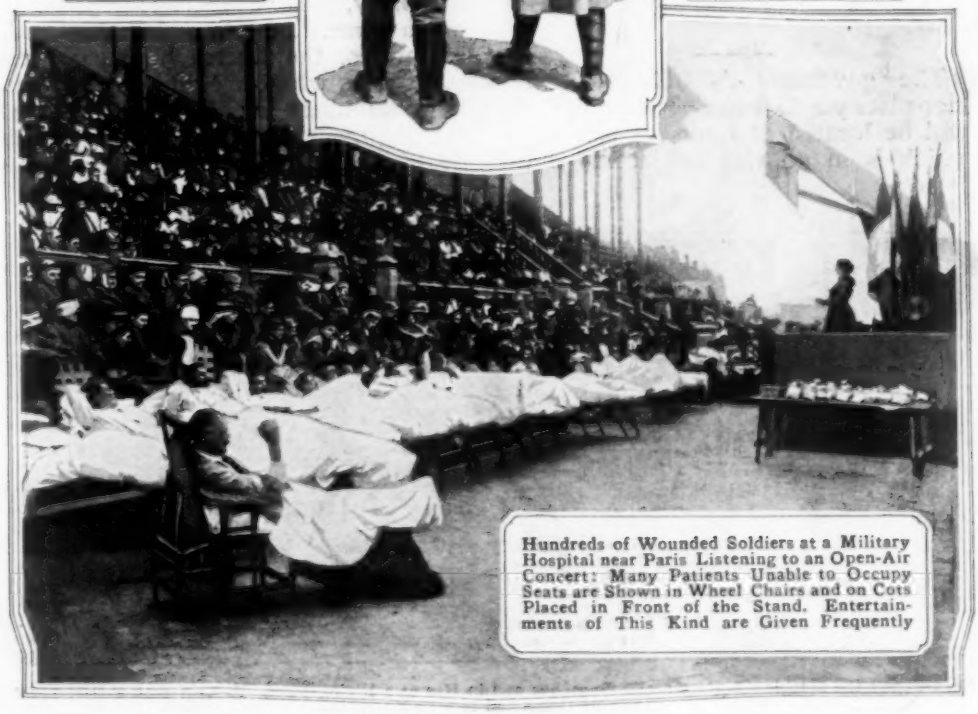
This Big Gun, and Others Like It, is being Used by the French on the Somme Front, Where Its Long Range, Great Destructive Power, and Mobility have Proven It a Most Effective Weapon

PACH PHOTO NEWS, INC.

Serbian Soldiers Returning to Camp with the Canteens of Fallen Comrades: After an Engagement a Battle Field is Always Strewn with Equipment Which, When It Is Possible, is Recovered



Hundreds of Wounded Soldiers at a Military Hospital near Paris Listening to an Open-Air Concert: Many Patients Unable to Occupy Seats are Shown in Wheel Chairs and on Cots Placed in Front of the Stand. Entertainments of This Kind are Given Frequently

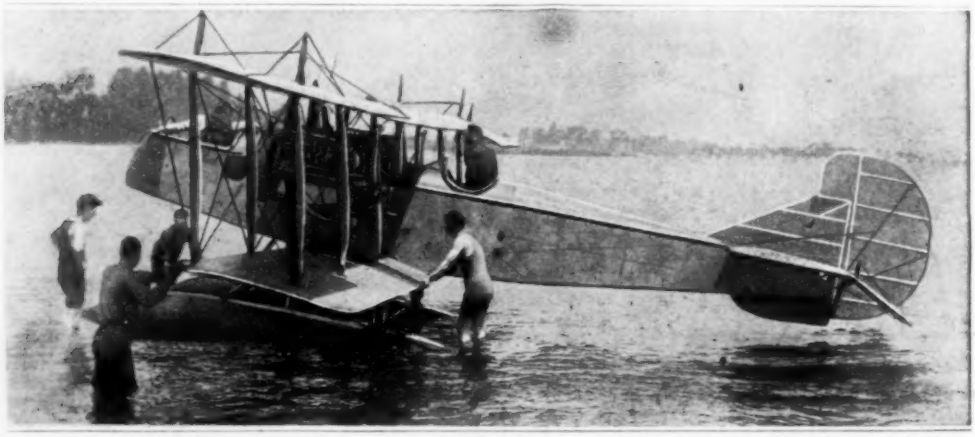
FARMERS PREFER SELLING POULTRY TO FEEDING IT

Farmers in many parts of the country are said to be selling off their poultry to such an extent that they will have few, if any, chickens to feed through the winter. The high prices of grains and feed are considered responsible for this tendency. A Nebraskan, who goes from farm to farm, buying poultry, reports that in many cases the farmers are selling all the chickens they have. Similar conditions obtain in other parts of the country. There is some difference of opinion as to the wisdom of this procedure. Many poultry men believe that though it costs a few dollars more to feed chickens at present prices, this will be more than compensated for by what can be made on poultry products. They point out that last year there were high prices for eggs both for the general market and for setting. Should such conditions be repeated, it is contended, the man who has kept a good stock of poultry will profit thereby, and the one who plans on buying his setting eggs will be the loser.

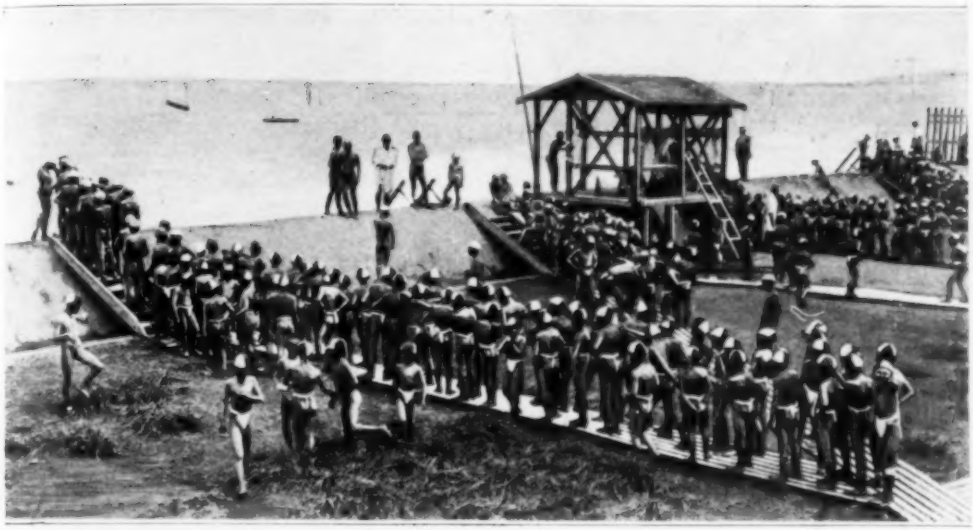
¶ The government's $11,000,000 armor-plate plant, it has been announced, will be located at some interior point which is in no way subject to naval attack.

LAND-AND-WATER AIR CRAFT SETS NEW RECORD

Navigating over a measured course between Newport News and Cape Charles, Victor Carlstrom late in August established a fresh world's record by driving the new amphibious flying boat of Curtiss design 661 miles in 8 hr. 41 min. The airman's performance is particularly interesting in view of the fact that he carried a passenger and, owing to a heavy fog, was forced to steer by compass. Much attention is being attracted to the craft, which is so constructed that in less than a half hour's time it can be converted from a water to a land machine. It mounts two engines, attains a maximum speed of about 95 miles an hour, and can be slowed down to 45 miles with safety. Recent tests witnessed by the navy aeronautical board and aerial authorities of this and foreign countries have demonstrated that the machine can take to its wings within a 1,200-ft. skim. Especially for military and naval purposes, because of its flexibility, the craft is looked upon with much favor. Attempts are being made to interest the United States government in it, while, according to reports, large numbers are being constructed for shipment abroad. Except for its dual landing arrangement, the plane is not of an unusual type.



This Shows the Machine Equipped with Pontoons and in Use as a Flying Boat. In Less than a Half Hour It can be Converted into an Aeroplane



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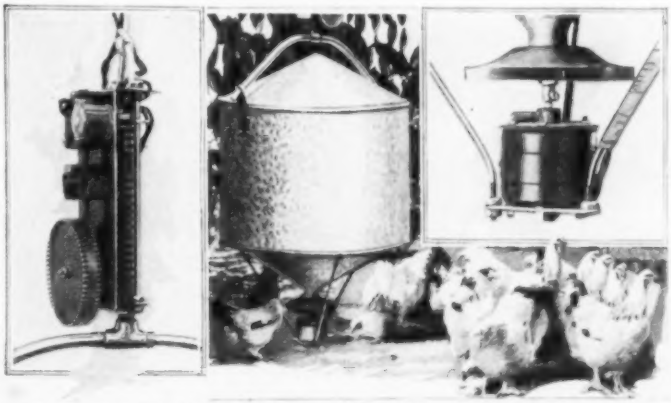
BATHING POPULAR SPORT WITH JAP SCHOOLBOYS

BATHING is one of the chief sports indulged in by the Japanese, and it is encouraged even more than in this country. During the summer months most of the schools near the sea erect bathing pavilions of the sort shown here, and the boys are given competent instruction in swimming and diving. The customary bathing costume is, from the American viewpoint, extremely abbreviated, more care being taken in covering the head and protecting the hair and scalp from the salt water, than in robing the rest of the body. The Nipponese, however, like certain European peoples, place much faith in the healthful effects of sunlight, and have a radically different view regarding the meaning of modesty from the average Westerner.

CHICKEN FEEDER OPERATES AUTOMATICALLY

Perfect regularity and accuracy in feeding chickens are secured by means of an automatic electric feeder, recently invented. The device consists of a measuring apparatus, a 60-qt. hopper, and an electrically operated distributor, fastened one below the other and designed to be hung in the chicken yard. The feeder is regulated by an eight-day clock of the alarm type, connected up by electric wires and capable of regulating several feeders. Its gearing is altered to accommodate a 24-hour dial and it is equipped with movable contact points, which are set at the hours selected for feeding. The measuring apparatus is built like a spring scale, the hopper taking the place of the scale pan and a pinwheel the place of the indicator. The wheel revolves in the same manner as does a scale indicator. Movable pins, set transversely in the circumference of the wheel, can be made to extend to one side or the other, according to the



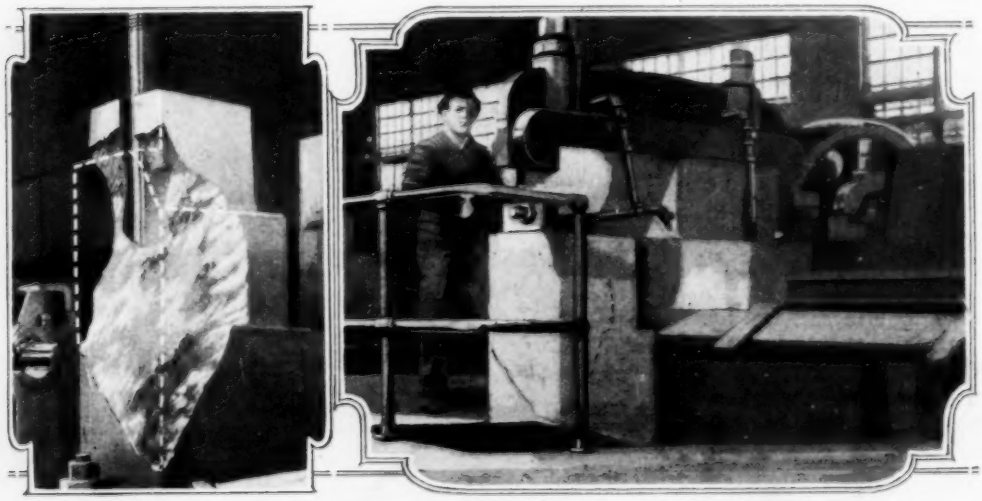
An Electrical Device Which, When Properly Filled and Adjusted, will Scatter the Proper Amounts of Chicken Feed at Predetermined Hours, without Any Supervision

feeding plan. If, for example, two quarts are to be fed in the morning, two pins will be set projecting from the side next to the supporting spring. The pin slot next in order of rotation will be left vacant, and if three quarts are desired for the noon feeding, the next three pins beyond the vacant slot will be made to project the same as the two. In this way the whole schedule is repeated on the wheel as many times as the number of pins permits.

At the feeding hour the contact made by the clock causes a coil near the pinwheel to raise a small rod, or pawl, to a point where it will ride on the projecting pins. This closes a switch which starts the distributor revolving and scattering the feed. As the weight in the hopper lessens, the pinwheel turns slowly, and finally a vacant pin slot passes beneath the pawl, allowing it to fall and shutting off the current. This prevents the distribution of more feed until the clock again makes an electrical contact.

BIG THERMIT WELD MADE IN VERY SHORT TIME

A thermit weld, which because of its great size involved a number of interesting problems, was recently made on a cast-iron shear bed in a Monessen, Pa., steel mill. The piece which had been broken off measured 5½ ft. by 37 in., and weighed 3,000 lb. Hence this undoubtedly was one of the largest thermit welds ever completed. The short time in which the repair was effected also makes the achievement notable. The mill was shut down on a Saturday noon to permit the beginning of the repair work. The shears were stripped, the fractured parts cleaned, and the broken piece put in position ready for welding. The following morning the applying of the wax for the mold was started and the mold box put in position. This box measured 110 by 119 in. and was held in place by a traveling crane. An oxyacetylene flame was used to cut the box to make it fit properly. The ramming of the molding material was completed the afternoon of the second day. That evening five crucibles filled with cast-iron thermit were supported over the mold box. After 20 hours of preheating the preheating holes were plugged up, the thermit metal ignited, and the resulting metal poured into the mold. This work was completed just 84 hours after the task was begun. In less than five days after the shutting down of the mill it was started up again and no subsequent delay was experienced.



Left: The Broken Part Stripped, Showing Where the 3,000-Pound Piece was Broken Off. Right: After the Repair had been Made. Dotted Line Indicates Where the Weld Took Place

MOTOR CAR CLIMBS FAR UP MT. HOOD ON CLEATS

For the purpose of demonstrating the hill-climbing abilities of a certain motor car, a seven-passenger machine was recently driven three-fourths of the distance up snow-capped Mt. Hood in Oregon. The test in some respects was as unusual as it was spectacular and interesting. The car finally turned back at a point about six miles from the base, where it is said more than a 50-per-cent grade was encountered. Not far past this place perpendicular crags and deep chasms are barriers to all but mountain goats and experienced climbers. In making the trip the car did not have to buck against deep snows, as might be inferred. It traveled over a wooden track consisting of cleated boards. As the car ascended, a gang of eight men picked up the track sections over which it had passed and placed them ahead of the front wheels. High altitude, speed grades, and low temperatures were some of the things encountered in making the climb.

In the Snow High on One Side of Mt. Hood. The Picture Indicates What a Steep Grade the Car Negotiated

The Test Was Not Merely Spectacular, but Also Severe. Before the Trip was Completed One Side of the Machine Was a Mass of Ice and Snow

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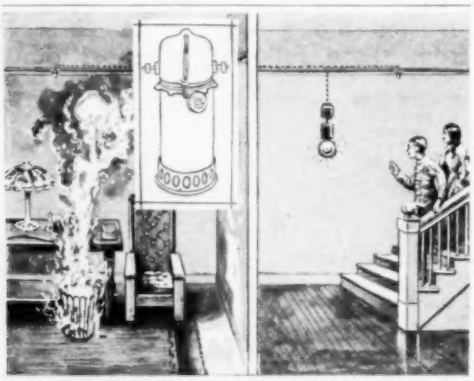
¶Parliament has taken steps to establish uniform time throughout the United Kingdom, thereby "abolishing" Irish time, which differed by 25 minutes from England's.

NEW TYPE OF AUTOMATIC FIRE-ALARM APPARATUS

An automatic fire-alarm device, constructed along lines quite different from those followed in most other alarm mechanisms, is now being introduced into stores, warehouses, etc. An alarm system in which this device is used can be employed with equal success in hot or cold rooms, or where the temperature is constantly changing. The essential unit of the system is a cylinder of thin copper, about the size and shape of a shotgun cartridge. When a fire starts in a room protected by one of these cylinders, the hot air caused by the blaze will almost instantly heat the air in the device. This raises a diaphragm in the cylinder and causes an electrical contact. This contact sounds an alarm and shows, on an indicator, the part of the building in which the fire is located. Variations in temperature caused by changes in weather or artificial heating systems

will not cause the diaphragm to operate because they come more slowly. A slow-leaking vent in the cylinder

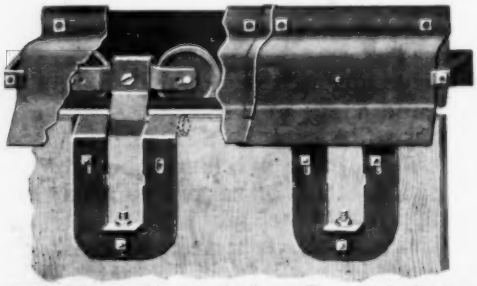


A Cylinder Which will Automatically Turn in an Alarm When a Blaze Starts in the Room Where It is Installed

permits adjustments to take place under such conditions, without sending in an alarm.

ADJUSTABLE HANGERS FOR BARN DOORS

With a view to overcoming the difficulties due to incorrect hanging of barn doors, or their warping, an Illinois firm has manufactured an adjustable hanger. Each door is hung by means of two U-shaped irons, which are bolted to its side with three bolts. Each of these irons is suspended by hinged members from two wheels that run in a troughlike track. The wheels and track are well protected by a metal cover having a wide hood. The three



By Turning the Nuts on the Screw Eyes, at the Bottom of the U-Shaped Members, the Position of a Barn Door to Which These Hangers are Fastened can be Accurately Adjusted

holes in each iron "U," through which the bolts pass, are oblong so that after a door is in place it can be raised or lowered a little. The means provided for doing this consists of a screw eye set over the bolt that passes through the base of the "U." The threaded end of this screw eye projects upward through a shoulder extending from the U-shaped iron and is held in place by a nut. By turning this nut the door is raised or lowered. Screws passing horizontally through the steel parts which hinge a "U" to a pair of wheels, may be adjusted to regulate the distance between the door and the wall.

SAN FRANCISCO-OAKLAND BRIDGE PROPOSED

Just as the increase of interurban transportation across intervening bodies of water has given rise to the great engineering problems in New York City, so also in San Francisco and vicinity the question of how to supply adequate transportation facilities across San Fransicso Bay has brought forth daring proposals. Because the great ferries which ply between San Francisco and Oakland are often taxed to the limit and the congestion at the big ferry terminals is steadily increasing, various civic bodies now advocate spanning the bay with a bridge five and one-half miles long, which would cost approximately $22,000,000. The proposal that has been made is to issue bonds to build the bridge and charge tolls, which would be the same as those now charged by the ferries. It is claimed that this arrangement would provide an annual revenue of not less than $3,000,000 per year, and that this would be sufficient to pay for the huge span in from 10 to 15 years. The preliminary plans which have been prepared call for a two-level structure. One level would be occupied by two roadways for slow-moving vehicles and one for automobiles, etc. The other level would have two tracks for overland trains and two tracks for interurban trains. There would be movable spans which would allow ocean vessels to enter the south end of the bay. The

Sketch Showing Proposed Bridge across San Francisco Bay: This Structure would Be Five and One-Half Miles Long and would Cost $22,000,000 According to Estimates

general plan, and this latter phase of it in particular, is being investigated by the War Department at Washington.

THREE-DECKED BARGE USED BY SHEEP RANCHERS

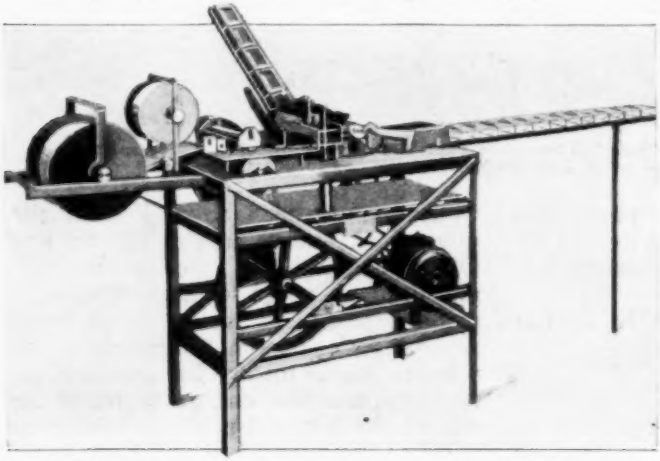
A barge of unusual design has been used this season for the first time in transporting sheep from the foot of Lake Chelan, Wash., 60 miles to Stehekin, at the head of the lake, and to other points along its shores. The craft has three decks and will carry about 2,500 ewes and lambs. By means of a broad gangplank the sheep can be let on or off any one of the three decks. The barge's chief use is in transporting sheep to and from the government range in the Chelan and Okanogan national forests. By this means much range formerly unused is made accessible. It was built by a navigating company, the ranchers advancing $2,500 toward its construction. A transportation charge is made for use of the barge, but those who contributed are allowed to use it gratis up to the amount of their contributions.

¶The American Society of Automobile Engineers proposes to make its name more truly descriptive by substituting "automotive" for "automobile," which now popularly indicates motor cars only.

A Three-Deck Barge Which is Used by Sheep Ranchers to Carry Sheep to and from Grazing Lands in Washington Which Otherwise would Be Inaccessible

MACHINE WRAPS PACKAGES AUTOMATICALLY

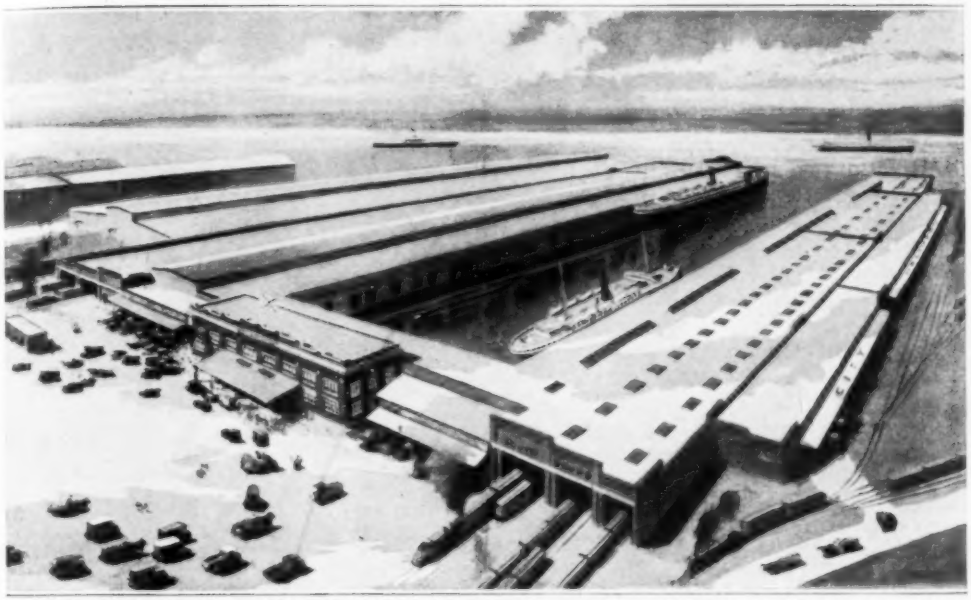
A wrapping machine which can be adjusted to wrap packages of various sizes rapidly, in a uniform manner, and without any manual labor, has been patented recently. Electric or other power may be used to operate the invention. For small articles the machine required stands about 30 in. high. At one end, which may be designated as the rear end, are suspended one or two rolls of paper, depending on whether a single or a double wrapper is desired. As each article to be wrapped falls into position at the lower end of a chute the proper amount of paper is unrolled, stretched beneath the package, and cut off by a knife. Thereupon a plunger thrusts the package downward into a recess, causing the paper to be pressed against the bottom and front and rear sides of the package. As soon as this operation is completed a second plunger, moving horizontally, shoves the article being wrapped toward the front of the machine. Simultaneously the wrapper is folded across the top of the package. The folding of the ends is then accomplished by pushing the article into a passageway and by the operation of arms which press against the ends at the proper time. If desired, means of applying paste to the wrappers may be employed, so that each package will be sealed.



A Machine Which Wraps and Seals Packages Automatically and can be Adjusted to Care for Packages of Various Sizes

NEW STEAMSHIP TERMINAL IN USE AT SAVANNAH

During the last few months the Ocean Steamship Company has completed a new terminal at Savannah, Ga., which is worthy of the attention of those interested in the steady, healthy development which the South is undergoing. When further extension of the old docks became impracticable a couple of years ago, it was decided to utilize the exisiting facilities for other purposes and construct at another site a thoroughly modern terminal to meet all present-day requirements and permit whatever future expansion increased shipping might eventually warrant. Therefore the improvement, which covers some 20 acres of the Vale Royal tract, was carried out. A central slip, 1,020 ft. long, 225 ft. wide, and 26 ft. deep at mean low water, was cut at right angles to the Savannah River. On three sides of it, and extending along the river in both directions, forming an immense "U," are concrete bulkheads and terminal buildings. The latter consist of steel-frame freight sheds, classed as north-bound, south-bound, city-delivery, and headhouse. Located at the land end of the slip and forming the terminal's entrance is a brick-and-steel building which is occupied by the administrative offices. Seventeen railway tracks, aggregating two miles in length, extend under the freight sheds and provide space for 225 freight cars. Ships arriving at the south-bound freight

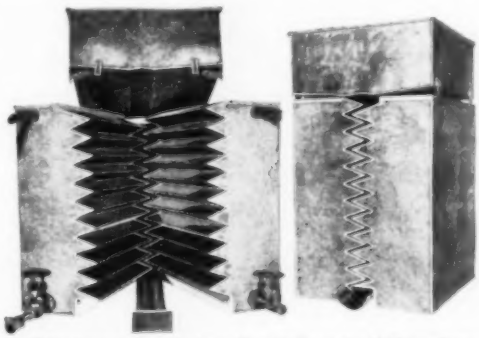


General Plan of Savannah's New Steel-and-Concrete Steamship Terminal Which has Replaced the Old Frame Wharves of the "River Front" and "Philadelphia Slip" Terminals

shed unload their cargoes directly into the waiting cars, local consignments excepted. In this and the city-delivery shed the concrete floors slope toward the cars, facilitating the handling of freight. Outgoing ships take on cargo at the north-bound shed, where the track platforms extend in a saw-tooth fashion and the floor is inclined toward the water. Elevated galleries suspended from the roof trusses provide direct passages from the waiting rooms to the landing stages for passengers. Fire stops divide the sheds into 12 compartments, and a 150,000-gal. reservoir provides water for the fire lines, which are several in number and conveniently located.

SANITARY MILK COOLER AND AERATOR

A milk cooler and aerator now being patented is so constructed that it does not expose the milk to dust or dirt. It possesses so large a cooling surface that it operates rapidly. Milk to be cooled is placed in a 10-gal. reservoir, in the bottom of which are two parallel rows of holes. Through these the milk flows down between metal tanks filled with ice and water. The adjacent sides of these tanks are composed of deep, sharp ridges that extend horizontally. They are so positioned that when the tanks are set close together they fit into each other, leaving a small space between through which the milk flows. Beneath the tank is a trough which catches the milk. If desired, pipes can be connected to the cooling tanks to permit frequent change of water. A cooler measuring 12 by 18 by 24 in. has a cooling surface of over 17 square feet and will cool 50 gal. of milk in an hour.



A Milk Cooler Which does Not Expose the Milk to Dust or Dirt as It Flows between Two Cooling Tanks Having a Combined Cooling Surface of 17 Square Feet

PEDAL CONTROLS NEW DRINKING FOUNTAIN

With the general installation of bubbling drinking fountains in public places has come a number of varieties in design and construction. One of the improved types, which in many places is supplanting all other styles, is equipped with a pedal at the base of the fountain by which the flow of water is governed, instead of by a hand lever or faucet. A shopper passing by with his arms filled with bundles, does not have to put down his packages before he can get a drink, but merely stoops over and at the same time presses his foot on the lever.

BEDCLOTHES HOLDER KEEPS SLEEPER'S FEET COVERED

For the purpose of overcoming the discomforts caused by bedclothing becoming disarranged at the foot of a bed, a bedclothes holder has been patented which can be fastened to the foot of a brass, or other metal, bed and will keep the sheets, blankets, etc., in place. The device consists essentially of two strips not quite so long as the bed is wide, between which the bedding is inserted. These two strips can be easily drawn together by means of a lever mounted at the center of a rod, which is placed parallel with the strips. This clamping lever can be adjusted to make room for as little or as much bedding as the season requires. Near each end of the holder are adjustable iron hooks that fasten to the angle iron at the foot of the bed which helps support the springs.

A Device to be Attached to a Metal Bedstead, Which will Keep the Sheets and Blankets in Place at the Foot of the Bed

THIS NEW YORK TOWN HAS TWELVE FIRE COMPANIES

The best fire protection for any community of its size in the United States is said by certain underwriters to be possessed by Tarrytown, N. Y., which has 12 fire companies, or approximately one company to each 1,000 persons. The equipment of this well-protected town includes nine pieces of automobile apparatus and three chemical engines. Within the past five years $75,000 has been expended for automobile equipment. The fire zone, which includes the business district, is protected by a high-pressure system. The apparatus which supplies the water for fire protection is electrically operated and develops a pressure of 275 lb. when the occasion demands.

SPLENDID AUTO ROAD BUILT ABOVE GOLDEN GATE CITY

At San Francisco the municipal authorities have lately completed the construction of a scenic motor road that encircles Twin Peaks, overlooking the city at an elevation of about 830 ft. above the sea, which is only three miles distant. The driveway, which is built of asphalt on a concrete base, forms a figure "8" about the two hills and offers a broad, smooth surface. It is approached by two different routes, each of which has a gradient of about eight and a half per cent. The peaks can be reached by automobile in about

DISTINCTIVE FIREPLACES AND ACCESSORIES

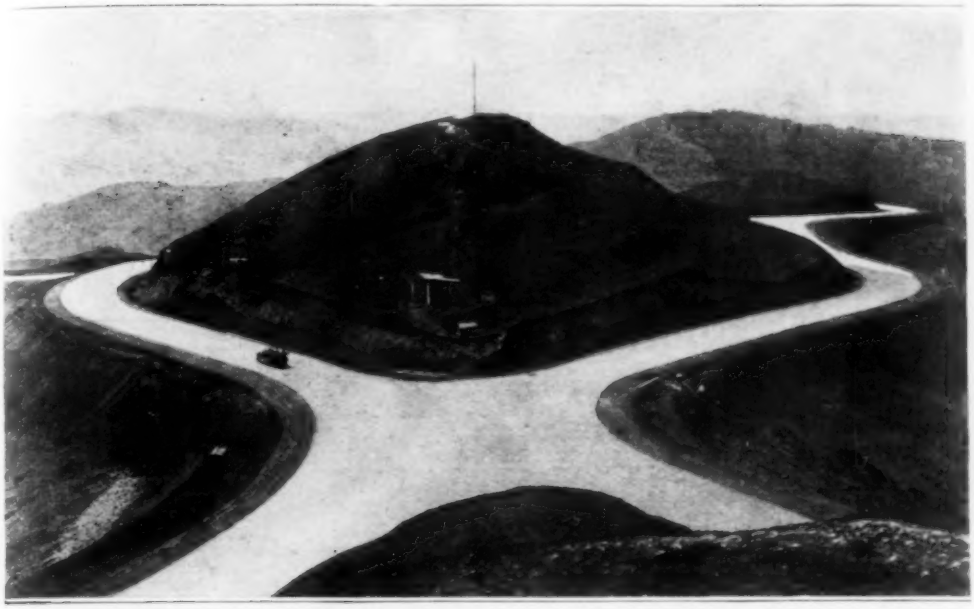


Figure-Eight Drive around Twin Peaks above San Francisco: The City and Bay Region Stretches Out in a Beautiful Panorama Below

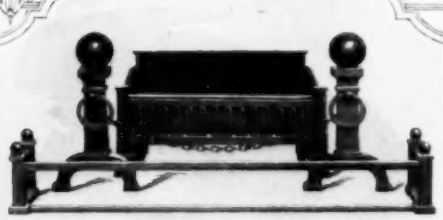
10 minutes and provide a magnificent view of the bay region. Two high mountain ranges form an inspiring background. The road was built at a cost of about $90,000 and is being enjoyed by great numbers of local as well as tourist motorists.

PAPER TEES ARE TO BE MADE IN CONVENIENT FORM

Of possible interest to the golfer is a new type of paper tee recently invented and soon to be introduced in a novel as well as convenient form. It is stamped out of light cardboard and bound in book form, as are postage stamps, containing a hundred blanks. Each of these is square and provided with a diamond-shaped opening in the middle and two slits, one extending from an outer edge toward the center, and the other from the hole toward the opposite side. Instead of molding a pinch of earth or wet sand on which to poise a ball, a player detaches one of these sheets from the book and tears it in halves. The slits enable the two sections to be fitted together in a crosswise position, while the angular depression then provided on the top serves as a cradle for the ball. This offers a solid tee which is invisible to the player when in use.

One Hundred of the Cardboard Tees are Bound in a Small Book, from Which They are Detached as Needed

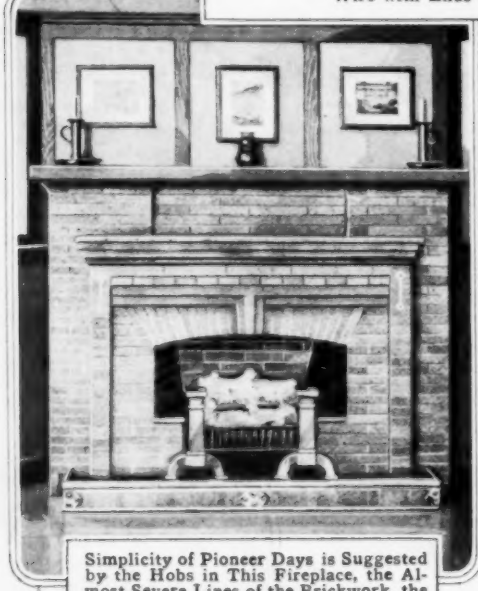
DISTINCTIVE FIREPLACES AND ACCESSORIES



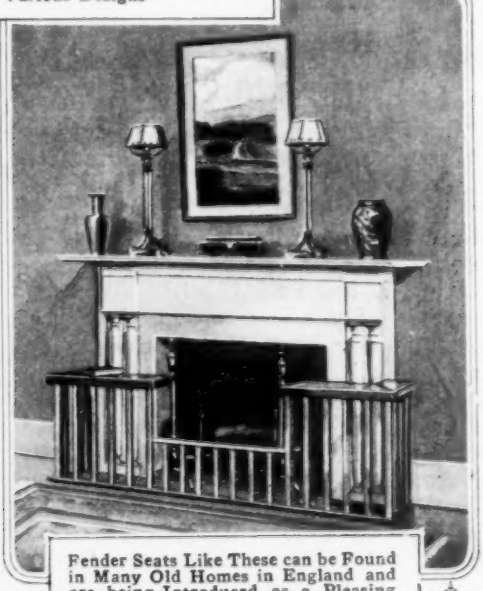
Fender, Andirons, and Grate That are Well Matched. The Latter Raises the Coals above the Bed of the Fireplace and Permits a Strong Draft

These Long Squatty Dachshunds Serve as Andirons That Are Novel and Very Durable

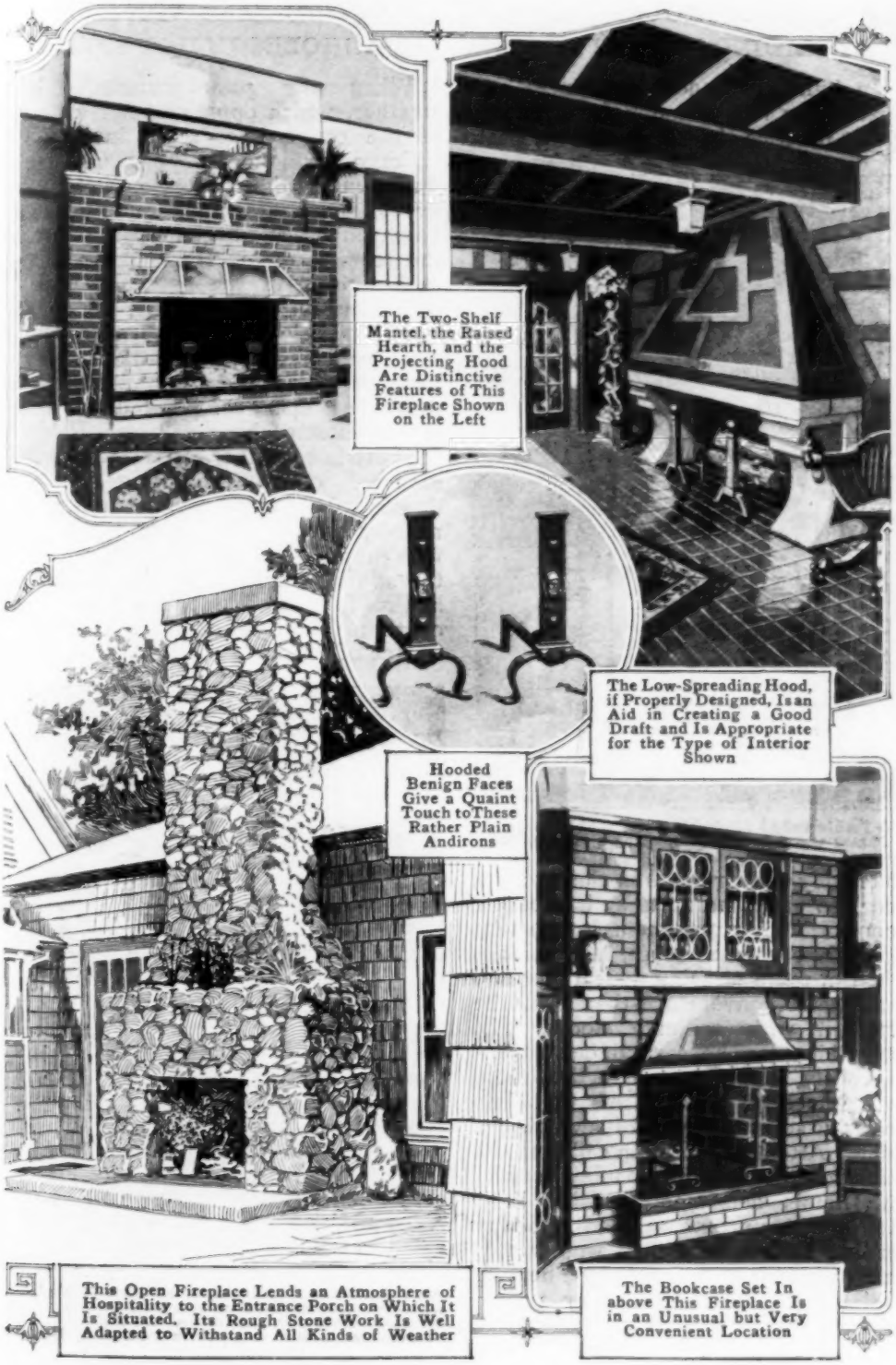
Long Slender Forks on Which Marshmallows, Corn, and Chestnuts can be Roasted Make the Fireplace a Fascinating Center on a Winter Evening. These Forks are Made of Heavy Wire with Ends of Various Designs



Simplicity of Pioneer Days is Suggested by the Hobs in This Fireplace, the Almost Severe Lines of the Brickwork, the Plain Candlesticks, and the Square Panels



Fender Seats Like These can be Found in Many Old Homes in England and are being Introduced as a Pleasing Feature in Modern American Homes



The Two-Shelf Mantel, the Raised Hearth, and the Projecting Hood Are Distinctive Features of This Fireplace Shown on the Left

The Low-Spreading Hood, if Properly Designed, Is an Aid in Creating a Good Draft and Is Appropriate for the Type of Interior Shown

Hooded Benign Faces Give a Quaint Touch to These Rather Plain Andirons

This Open Fireplace Lends an Atmosphere of Hospitality to the Entrance Porch on Which It Is Situated. Its Rough Stone Work Is Well Adapted to Withstand All Kinds of Weather

The Bookcase Set In above This Fireplace Is in an Unusual but Very Convenient Location

SPACE AND TROUBLE SAVED BY SLIDING PANTRY DOOR

In building modern residences and apartments it is becoming a more frequent practice than it was in the past,

The Problem of a Practicable Door for This Hedged-In Pantry was Solved by Employing a Sliding One

to employ sliding doors in closets adjacent to bedchambers and dressing rooms. The arrangement is one that not only conserves space, but which is often of more pleasing appearance and far greater convenience than could be attained with ordinary doors. The same idea can be carried out advantageously almost anywhere that room is cramped or there seems to be no really practicable way of swinging a door. Attention has been called to the installation of a sliding pantry door by an Illinois door-manufacturing firm. As is not uncommon, the doorway leading from the kitchen was in this case hedged in on one side by a heating radiator and on the other by a sink. The advantage of making use of the plan in such places is apparent.

ELECTRIC FANS VENTILATE MANHOLES IN HOT SPELL

When the past summer's hot weather, which oppressed many parts of the country, grew so intense in Chicago that the manholes and conduits under the streets became like ovens, the Chicago Telephone Company employed novel means to make the temperature in these places bearable. Many of the openings in the street lead into rooms of considerable size, just below the sun-heated pavement, and having no ventilation save through the one entrance. When a manhole is open, the law requires that it be protected by a railing. During the very hot weather electric fans were mounted on these railings, facing downward. Power was secured from near-by wires. The draft which the fans produced, while not cool, relieved the stifling condition of the manholes and made it possible for the linemen to continue their work with a certain degree of comfort.

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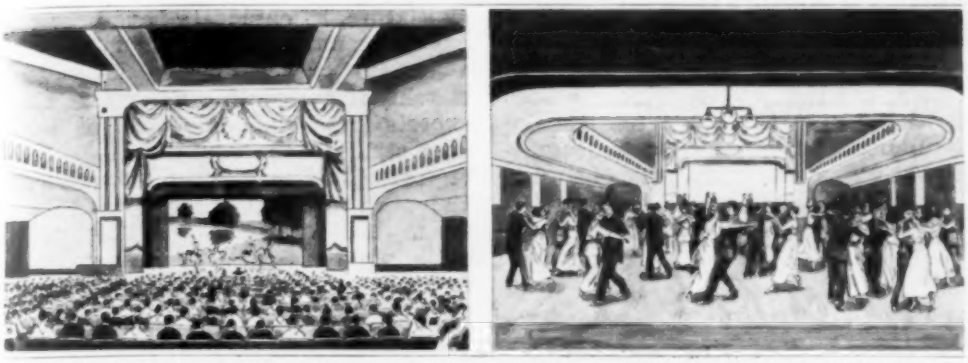
An Electric Fan Installed above an Open Manhole in a Chicago Street during Last Summer's Intensely Hot Weather. Only with This Means of Ventilation Was It Possible for Men to Work in the Stifling Underground Chambers



An Electrically Controlled, Adjustable Floor Doubles the Usefulness of This Los Angeles Hall, Which can be Employed with Equal Facility as Either an Auditorium or Ballroom. The Change can be Made Quickly

ADJUSTABLE FLOOR DOUBLES AUDITORIUM'S USEFULNESS

At Los Angeles a combination auditorium and ballroom has been constructed along interesting lines. The floor rests on powerful electric jacks and by merely throwing a switch it can be raised or lowered so as to fit the room for whatever function it is to serve. Normally the floor is about three feet below the level of the stage. When there is to be dancing, however, the seats are removed, the current turned on, and the floor elevated to the same height as that of the stage. The latter is then thrown open so that one large room is provided. One of the particularly good features of the arrangement is that the scheme has been carried out so skillfully that regardless of whether the hall is used as a theater or ballroom, it serves its purpose well and in neither case has an unfinished or temporary appearance. The floor can be raised or lowered in about five minutes' time.

CAN OPENER OPERATES BY FOOT POWER

A can opener which operates by foot power has been produced for use in hotels and restaurants where there are many cans of preserved goods to be opened, and where the ordinary method not only takes much time but often results in cutting the hands. The new patented opener consists of a plunger, to the lower end of which is fastened a foot lever and to the upper end a bracket holding a circular toothed cutter. The plunger extends up through a hole in the table and is normally supported by a coil spring positioned between the bracket and the table top. By placing a can under the cutter and bringing the latter down, by operating the foot lever, the top of a tin container can be severed quickly. By means of a setscrew the bracket can be adjusted to cans of various heights.

Can Opener Which Operates Rapidly: A Single Stroke of the Toothed Cutter Is Sufficient to Sever the Top of a Can

BORAX USED LIKE GRAVEL ON OREGON ROAD

One of the roads which passes through Curry County, Ore., has the distinction of being topped with nothing but borax for the distance of a mile.

View of Highway in Curry County, Oregon, Made Entirely of Borax Found in the Vicinity

The highway built in this unusual way is in excellent condition. A company having large borax holdings in California bought a farm in Curry County because of its great borax deposits. As yet these have not been developed and the farm is rented for agricultural purposes, but certain improvements have been made, among them this peculiar highway. In this region there was no material so available for building the thoroughfare as the borax.

IOWA'S LAKES INCLUDED IN BIG CONSERVATION PLAN

The hundred and more lakes which are scattered over Iowa, chiefly in the northern part, are about to be included in what doubtless will be one of the most comprehensive plans ever adopted by any state to conserve its bodies of water. At the direction of the Iowa legislature, 20 engineers have been engaged for more than a year in making a careful survey of the lakes and marshes in the state. At the same time experts from the state colleges have been studying the wild life in the lake region. This mass of information is about to be embodied in a report which, it is expected, will be used in outlining a program of improvement that will cover five or more years. Certain of the lakes, probably about 50 in all, will be set aside as game preserves. The fish grown at the state hatcheries will be transferred to these lakes and other steps taken for the benefit of sportsmen. About 50 other lakes will be designated as resort centers. In some cases it may be deemed advisable to construct dams to raise the water level of these lakes. A third group will be drained. Included in the latter class will be many which are so shallow that they freeze solid in winter and dry up in summer.

In the matter of flood control, the engineers believe that Iowa will be more fortunate than those states which have been forced to spend large sums to control swollen streams. The Iowa project includes the construction of large reservoirs, which though they would be located near the northern boundary, would be of benefit to the entire state. These can be built at comparatively low cost, according to estimates which are being included in the report. In draining marshes and lakes the chief value will not be derived from reclaiming the land once covered by water, considerable as that item would be, but from the large area adjoining these marshy places which could be drained much better. Such land only needs to be freed of its excess of moisture to begin producing, but land that has actually been under water for a long period can only be reclaimed by a rather slow and costly process. It has been found that some of the lakes which once had fine gravel beds are now filling up with mud. The conservation plans include dredging these and providing against the gradual refilling in the future.

BEAUTIES OF YELLOWSTONE PARK IN WINTER

A Dwarf Cedar Incased in What Looks Like White Marble

Clearing the Railroad Line to Yellowstone, Montana, the Western Entrance to the Park, Which is Closed All Winter by Deep Snow

Pine Trees Incrusted with Ice Formed by the Freezing of Vapor from a Near-By Geyser

The Great Falls of the Yellowstone are Shown in the Middle Distance, Almost Frozen Over. Note the Bridge of Ice below the Cataract

The great majority of tourists who wish to see Yellowstone Park make the trip in the summer and consequently the winter beauties of that great national playground are known to comparatively few. The inaccessibility of the park in the cold season is, of course, responsible for this. In the winter the hot springs, the geysers, and the falls all assume aspects which in some respects are more striking than anything which one sees in the summer. For example, the Great Falls of the Yellowstone are almost, if not entirely, frozen over at times, and at the foot of the great cataract a graceful ice bridge forms. The vapor constantly rising from the geysers freezes on the near-by trees and rocks week after week, and incrusts them with ice which assumes the most fantastic shapes. On the level stretches the snow often lies 8 and 10 ft. deep, and in the ravines and gorges it is 15 and 25 ft. deep.

GIRAFFE SHIPPED ACROSS OCEAN IN A TALL CAGE

An example of the unusual difficulties encountered in transporting captive wild animals from their native haunts to civilized lands, where they are put on display in "zoos," is found in the means taken recently to bring a giraffe from West Africa to the New

York Zoölogical Gardens. To give the beast some degree of comfort and yet make it possible to handle him with the minimum of trouble, it was necessary to build what was virtually a portable stable, measuring 8 by 8 ft. at the base and 18 ft. high. In this the animal was brought across the Atlantic and deposited on the docks at Staten Island, where the accompanying photograph was taken. The big ropes by which the unusual consignment was lifted about may be seen on the sides of the "stable."

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West African Giraffe and the Portable Stable, 18 Feet High, in Which He was Recently Brought to New York

OHIO CAPITAL TO IMPROVE LINCOLN HIGHWAY IN WEST

The worst section of road in the whole Lincoln Highway, a stretch about 12 miles long located some distance east of Fallon, Nev., bids fair to be transformed into a smooth, hard thoroughfare with the aid of eastern capital. A prominent automobile concern in Toledo, Ohio, has agreed to place at the disposal of the Lincoln Highway Association the sum of $50,000 to be expended in this improvement, providing the state of Nevada will supply a similar amount. In acknowledgment of this gift this portion of the road will be named in honor of the Toledo concern. This particular 12 miles is known as Mud Flats and stretches across a wide uninhabited desert. The flats, once the bottom of prehistoric lakes, are covered with fine alkaline dust, 2 or 3 in. deep, below which there is a thick mud caused by seepage from the near-by mountains. Churchill County, in which they are located, has an area of 5,000 square miles and a population of only 3,000, but in spite of this sparse population it spent over $10,000 last year in road construction. It can be readily understood that local resources are not sufficient to bring this section of the Lincoln Highway up to the standard that ought to be maintained. Special committees in California are also engaged in raising $50,000 to be used on the Mud Flats section. The association has set aside 1,000 miles of western Lincoln Highway which it hopes other public-spirited individuals and concerns will improve as memorials to themselves or others, as the Toledo company has agreed to do.

MACHINE-GUN TROOP MAKES SPLENDID TIME RECORD

Recently the machine-gun troop of the 9th Cavalry, while practicing at Camp Stotsenburg, P. I., went into action, from a gallop, in 12⅖ sec., thereby making what is believed to be record time for cavalry machine guns. Not only did the men do astonishingly rapid work, but the fine control which they had of their guns is shown by the fact that they literally shot the line of targets down after scoring 73 hits on 65 per cent of the targets, firing 240 rounds in 1 min. 10 sec., the range being battle sight. At another time during the same series of tests, the troop scored 50 per cent of figures hit at 550 yd., in 30 seconds' firing, and 96 per cent of figures hit at 780 yd. in one minute's firing.

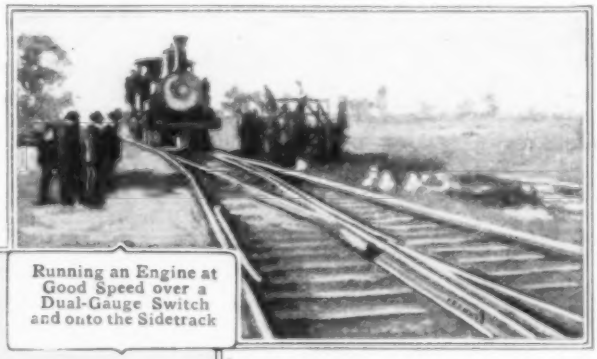
MOTORCYCLIST'S HOBBY WINS HIM CITY JOB

There is a man in Norwich, Conn., whose unfailing promptness in voluntarily going to fires on his motorcycle has helped him win a place on the municipal pay roll. However, the courtesy which supplemented the promptness also had something to do in securing the position. For about three years this motorcycle rider answered practically every fire alarm and, in following what became a hobby with him, he got into the habit of stopping for the deputy fire chief and taking him along in the sidecar. The deputy works in a shop about two miles from the center of Norwich. Almost invariably the pair arrived on the scene as soon as the fire engine, and sometimes before it. Recently the authorities saw fit to place this man on the pay roll, and hereafter he will be paid for his services. In three years he has answered more than 200 fire calls.

Motorcyclist and the Deputy Fire Chief, Whom for Three Years He Voluntarily Took to All Fires. This Courtesy Won Him a Position on the City Pay Roll

RAILROAD SWITCH BUILT FOR DUAL-GAUGE LINE

A railroad problem which is fast becoming obsolete in this country—the problem presented by different railway lines having different gauges—is still a very serious one in Australia where, for example, the gauge in Victoria is 5 ft. 3 in. and in New South Wales 4 ft. 8½ in. Now that the systems there have been joined together, it is believed that a uniform gauge must ultimately be adopted, but such a change will necessarily take years to complete. As a means of making interchangeable the rolling stock of roads of different widths, a dual-gauge system on which trains of either gauge can operate, has been devised. With this system three rails are employed instead of two. The chief problem in devising such a railroad has been the construction of switches. What has been called a third-rail switch seems to solve this difficulty. In this switch the rails are so merged and curved that cars of either width move over it



Running an Engine at Good Speed over a Dual-Gauge Switch and onto the Sidetrack

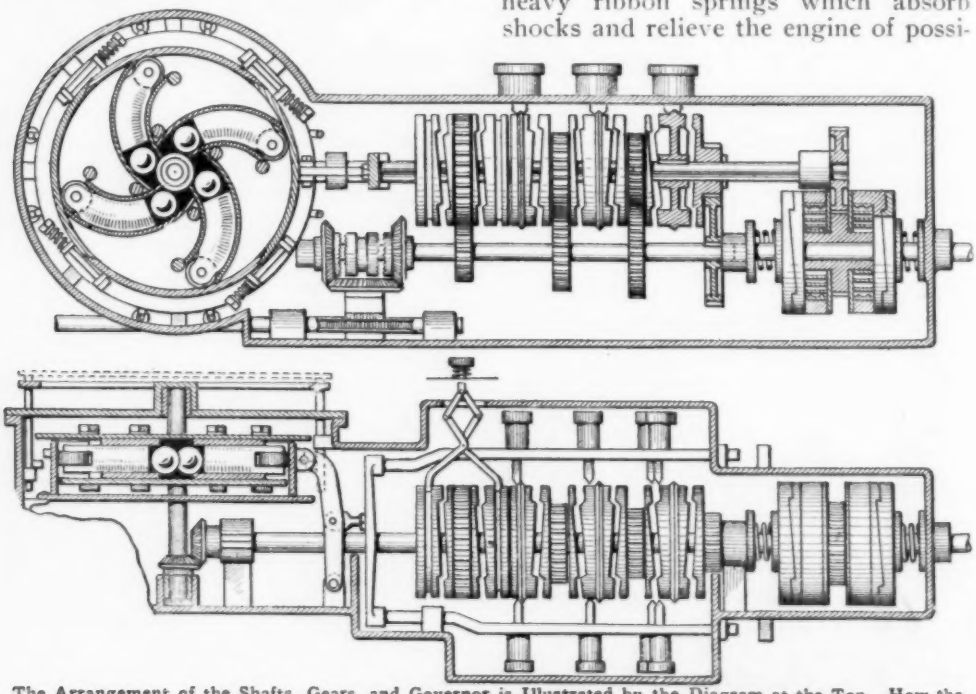
Dual-Gauge Track and Skillfully Devised Switch for Rolling Stock of Two Widths

without interference. In a test made a few months ago an engine running 40 miles per hour passed over one of these switches in a manner that was pronounced satisfactory. The track is laid so that the single rail comes next to the station platforms.

AUTOMATIC GEAR-SHIFTING SYSTEM FOR MOTOR CAR

Without calling into play other than well-known mechanical principles, a Chicago inventor has developed a comparatively simple automatic transmission gearing for motor cars. Although its basic purpose is the elimination of manual gear shifting, its influence is by no means limited to this single function. It permits the use of smaller engines than are now employed, reduces fuel consumption approximately 30 per cent, manifestly simplifies the operation of a vehicle, and lessens the wear and tear on a motor. Electric appliances are not depended upon, stalling and gear stripping are obviated, and the flexibility of a car is placed in its transmission system rather than in the power of its motor. Furthermore the engine is allowed to operate at its most economical speed.

The operation of the mechanism is controlled by a governor which is directly responsive to the speed of the drive shaft. Change of gear ratios is effected without the knowledge of the chauffeur, while the speed of the car is determined largely by the amount of fuel fed to the cylinders. All of the gears are constantly in mesh, and do not slide in and out of engagement as in ordinary practice, thus making possible the use of double helical teeth. This eliminates all noise due to so-called gear shifting. Clutches of the jaw-and-tooth pattern are employed, while driving is done through two heavy ribbon springs which absorb shocks and relieve the engine of possible strain. When the shaft is rotated the resistance of the car carried to the gears causes one of these springs to wind and the other to uncoil until the



The Arrangement of the Shafts, Gears, and Governor is Illustrated by the Diagram at the Top. How the Movement of the Yoke, to Which the Steel Fingers are Attached, Causes the Various Clutches to Engage and Disengage, is Shown by the Lower Drawing. The Shaft at the Left Extends to the Engine; That at the Right, to the Driving Axle

force is equalized, motion then being imparted to the gears and car.

To describe the mechanism briefly, there are four parallel shafts, one of which extends from the engine in the usual manner and carries a worm pinion meshing with a gear on an intermediary shaft. The opposite end of the latter has a bevel gear that works between two loose ones, opposed to each other, on the second parallel shaft. It is here that the forward and reverse drives are effected by the medium of a two-faced jaw-and-tooth clutch operated by a pedal. The last-mentioned shaft carries a series of keyed gears in mesh with loosely mounted ones on the third parallel member, which operates the governor. Clutch members are provided on either side of the latter drivers. These are thrown in and out of engagement by fingers fixed to a yoke that is moved back and forth by the centrifugal force of the governor. The speed of the latter, which is determined by the pull on the engine, thus shifts the gears.

Although all of the gears on the second and third parallel shafts are constantly in mesh, driving can be accomplished through only one set at a time, the others idling. The power transmitted through the so-called third parallel shaft is carried through the previously mentioned torsion springs to the fourth shaft, which is connected with the driving axle.

The entire mechanism is inclosed in an oil-tight case. Provision is made to enable a driver to cut out the governor and brake his car by compression. The invention is fully protected by patents.

SPEED OF NEW SEPARATOR DOES NOT AFFECT CREAM

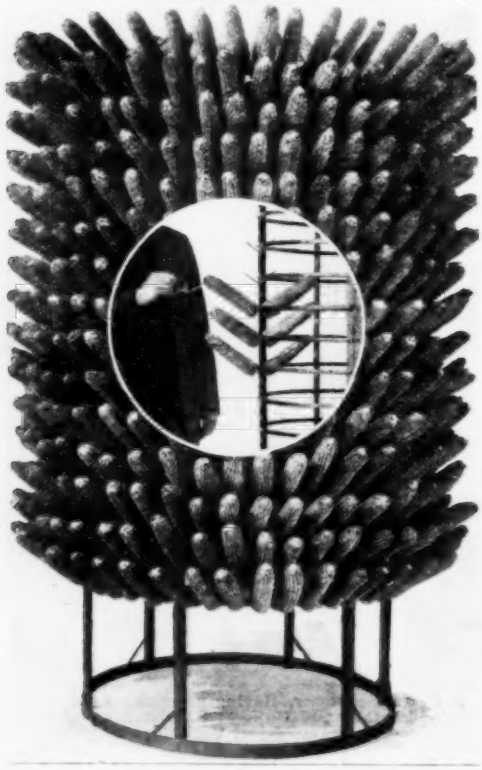
An improved separator is now on the market which will separate cream of uniform consistency regardless of marked variations in the speed at which the machine is operated. With separators of the ordinary type perfect skimming is obtainable only when a certain speed is maintained, a condition which is difficult to fulfill with hand-operated apparatus. For this reason there is apt to be considerable loss in using a separator. This new patented machine will produce uniform results when operated at any speed ranging from 35 to 55 revolutions per minute. This is due to the fact that the flow of milk into the central tube-shaped member, called the bowl, is governed by suction. As the bowl revolves it creates a vacuum which draws in the milk from the large supply can. Increased speed causes increased flow and, simultaneously, more skimming force is generated, so that at all speeds, within stated limits, the cream is of uniform consistency.

A Cream Separator, Having a Suction Feed, with Which Cream of Uniform Consistency can be Secured Regardless of Variations in Speed

¶ Recently, in testing the strength of fish glue, a pull of 6,030 lb. was required to separate the halves of a 1-in. wooden block that had been cemented together with this adhesive.

SEED-CORN RACK ON WHICH ALL EARS DRY THOROUGHLY

The increasing emphasis which is being placed on the thorough drying of seed corn has doubtless had something to do with the designing of a



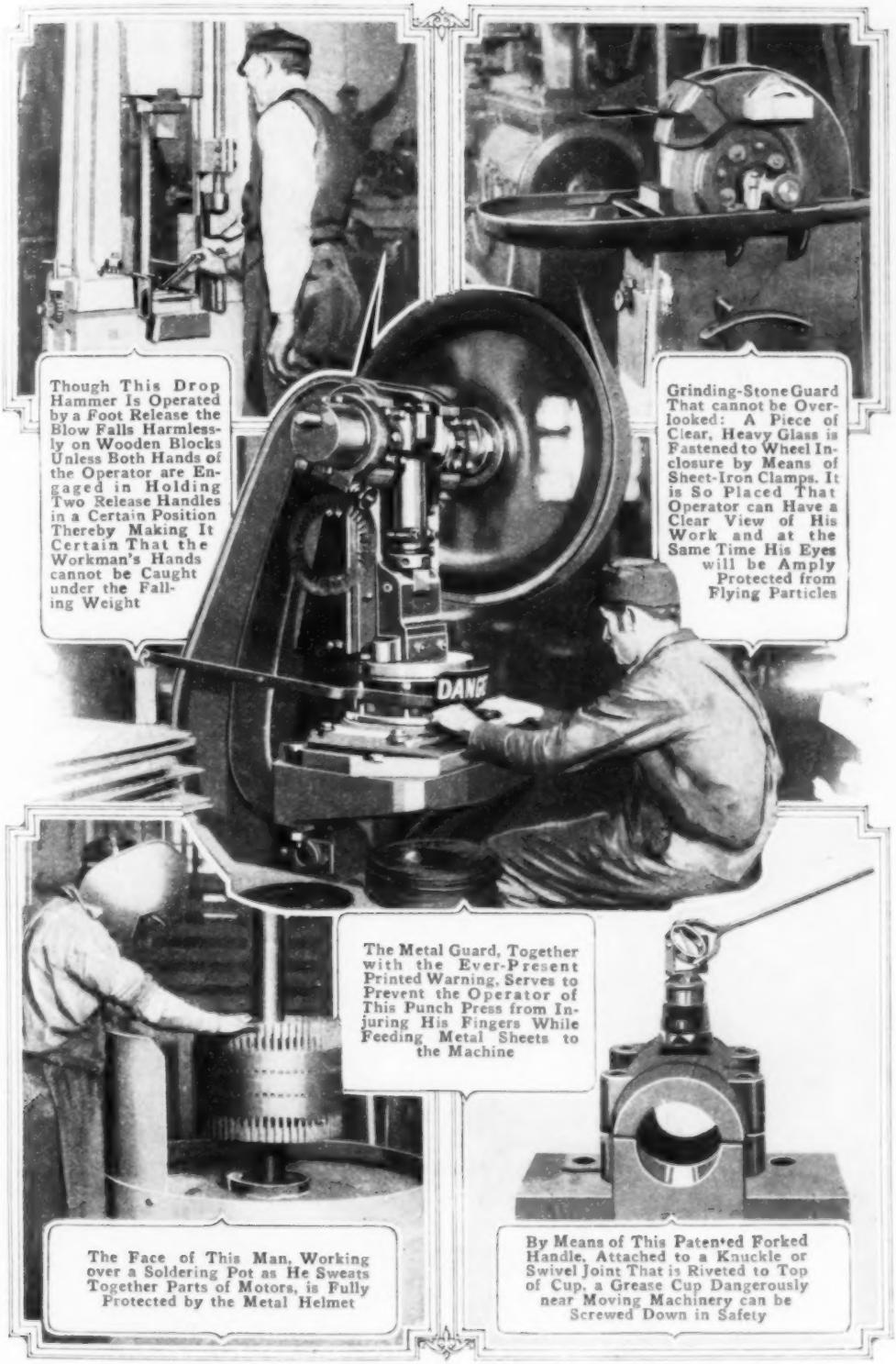
A Seed-Corn Drier Capable of Holding 1,400 or 1,500 Ears in Such a Way That Each Ear will be Cured Perfectly

rack on which the ears of corn selected for planting can be dried in such a way that no two will touch, and free circulation of air about each ear is assured. The rack is 6 ft. high and is composed of eight angle-iron uprights to which are fastened 15 circular bands, divided in halves so that the rack can be taken apart, for convenience in carrying when loaded. On these bands seed ears are hung in pairs. The special hooks used to support the ears are shaped like a wide-spreading "W," the two lower points of which have been drawn close together. Each of the two extremes of this hook is inserted in the pith at the big end of an ear and then the pair is hung on a band, with the small ends slanting upward. When properly placed they will cure without molding or souring, and no mice can get at them. The size described will hold 1,400 or 1,500 ears. A flat rack is made to hold about 300 ears.

NEW FEATURES INTRODUCED IN "SHOPS BUILDING"

An interesting manifestation of the present tendency in the economic world toward combination and coöperation is found in the increasing number of "shops buildings" in large cities. These are skyscrapers containing from a dozen to scores of small dealers, who by reason of their combined drawing power are proving serious competitors of the department stores. In one large shops building in Chicago, in which the first 14 floors are occupied by small dealers, several special features have been introduced to overcome conditions which handicap the tenants because they have to deal with a public as yet little accustomed to shopping in these buildings. For example, an information bureau is maintained in the corridor on the main floor. Here a woman, constantly in attendance, is ready to tell in just what shops any desired articles can be found. Because she knows personally all the dealers in the building and something of their stocks, she can give inquirers an idea of the range of prices in each establishment, thereby saving buyers much inconvenience. The owners of the skyscraper issue a little monthly magazine containing news of Chicago's business district and particularly of the building and its occupants. Many of the shops place their advertisements in this organ, which aims especially to foster a community spirit. An interesting service, maintained for tenants and prospective tenants, is a count made one week each month, of the number of persons entering the building. The average, which is steadily increasing, is over 50,000 for a single week.

DEVICES THAT SAFEGUARD MACHINE-SHOP MEN



Though This Drop Hammer Is Operated by a Foot Release the Blow Falls Harmlessly on Wooden Blocks Unless Both Hands of the Operator are Engaged in Holding Two Release Handles in a Certain Position Thereby Making It Certain That the Workman's Hands cannot be Caught under the Falling Weight

Grinding-Stone Guard That cannot be Overlooked: A Piece of Clear, Heavy Glass is Fastened to Wheel Inclosure by Means of Sheet-Iron Clamps. It is So Placed That Operator can Have a Clear View of His Work and at the Same Time His Eyes will be Amply Protected from Flying Particles

The Metal Guard, Together with the Ever-Present Printed Warning, Serves to Prevent the Operator of This Punch Press from Injuring His Fingers While Feeding Metal Sheets to the Machine

The Face of This Man, Working over a Soldering Pot as He Sweats Together Parts of Motors, is Fully Protected by the Metal Helmet

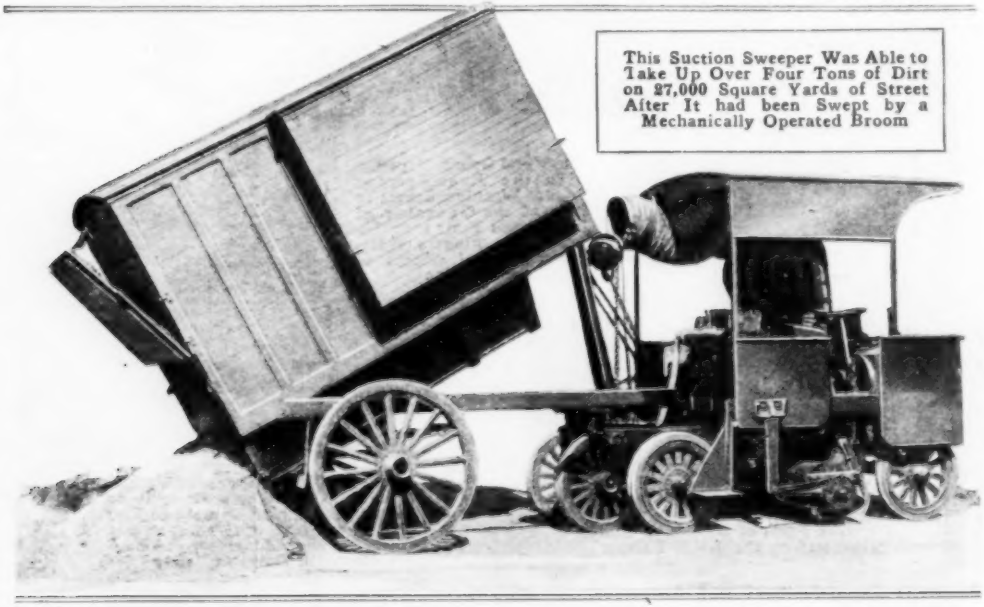
By Means of This Patented Forked Handle, Attached to a Knuckle or Swivel Joint That is Riveted to Top of Cup, a Grease Cup Dangerously near Moving Machinery can be Screwed Down in Safety

BULLET-PROOF JACKETS LINED WITH STEEL

In many instances the evolution of modern military uniforms and arms has been marked by a return to types of ancient and medieval days. Perhaps the steel helmet is the most striking example of this tendency. Now a London firm has patented and is manufacturing a steel-lined officer's jacket which suggests the old coats of mail, though in outward appearance it resembles an ordinary close-fitting coat. It is claimed that the jacket will resist a .45-caliber revolver bullet at 20 yd. The garments are fitted by experts and the highly tempered steel with which they are lined is said to be so evenly distributed that the slight additional weight is not apparent to the wearer. It is believed this jacket would afford much protection against shrapnel fragments.

SUCTION SWEEPER FOR STREET CLEANING

A suction street cleaner, recently tested in Sandusky, Ohio, was able to gather up 8,208 lb. of dirt and dust on 27,000 sq. yd. of street surface immediately after the thoroughfare had been swept by the old broom-machine method. This vacuum cleaner consists of a gasoline engine, mounted on four wheels, and a detachable three-wheel trailer. The engine operates a circular broom which throws the dust forward into a nozzle having a long narrow mouth that comes close to the pavement. Through this the dirt is sucked by a large fan into a conduit that extends overhead and to the trailer at the rear, where the coarse dirt is deposited in one chamber and the fine dirt in another. The body of the trailer can be raised at its front end by means provided, so as to dump the collected refuse through a door at the rear. A watering cart can be substituted for the trailer when desired and a squeegee used in place of the broom. The squeegee is composed of adjustable shovels having flexible shoes and is designed to aid in thoroughly scrubbing a pavement.



This Suction Sweeper Was Able to Take Up Over Four Tons of Dirt on 27,000 Square Yards of Street After It had been Swept by a Mechanically Operated Broom

With the Aid of This Electric Outfit, a Group of Wheat Growers in Kansas Cut Their Threshing Expenses 50 Per Cent. The Saving Paid for the Equipment the First Season

ELECTRIC THRESHING OUTFIT USED BY KANSAS FARMERS

During the wheat-harvesting season in Dickinson County, Kan., this year, threshing was done electrically for the first time, so far as it is known, in the history of the state. A group of farmers in one locality were unable to engage a steam outfit for the time it was desired. They therefore joined together, forming a coöperative association, issued stock to the amount of $1,200 and bought a separator and fair-sized motor. With this equipment they threshed their wheat, obtaining electric current from the transmission lines of a lighting company supplying energy to towns in that vicinity. Nearly all of the farms in the immediate district could be reached from some point of the transmission system with a 1,000-ft. conductor cable. Hands were traded back and forth so that the labor question was readily solved. The services of a mechanic were acquired and the equipment kept in good running order. As a result of their trouble the farmers reduced their threshing expenses 50 per cent, cutting the cost per bushel from eight to four cents. This saving paid for the equipment, which will be depended upon in the future.

CA recently established school offers correspondence courses in theoretical military instruction.

SECTIONAL FILING DESK HAS SLIDING TOP

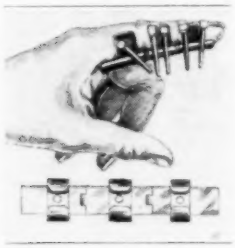
A new model of a flat-top writing desk, built to contain many files of cards, is so arranged that every card is in easy reach. The desk is built in sections, each drawer being a unit. Either end of the desk is made up of two, three, or four drawers, according to the size desired. Beneath these drawers, forming supports for the whole desk, are four-legged pedestals, which also are detachable units. The central portion of the top of the desk is stationary, but the end portions over the top drawers are movable and can be pushed back to give easy access to

A Filing Desk Which is Made in Sections: Portions of the Top Are Movable, Giving Easy Access to the Top Drawers

the back end of the top drawers. The compartments in which the cards are filed extend across the drawers transversely.

MAGNETIC DEVICE AN AID IN DRIVING NAILS

A simple magnetic device which is worn on the index finger has been invented to enable a carpenter, or other mechanic, to drive nails with rapidity. It consists of three magnetized metal plates, hinged end to end, having a combined length of about 2½ in. These plates are held against the front, or palm, side of the finger by means of spring clasps which fit around the member. With the aid of this patented device a number of nails can be held between the thumb and finger, and as one nail is driven, another can be pushed forward, into position, by the thumb without any danger of dropping the other nails.



¶It has been found that a coating of tank oil applied to inaccessible metal surfaces in steel vessels may be used with success as a preservative, in place of scaling and painting.

LONG, NARROW BRICK DEPOT UNINJURED BY REMOVAL

In moving the Southern Railway station in Danville, Va., a distance of 50 yd. the contractors in charge recently accomplished a task that was especially difficult because of the dimensions of the structure. Its length is 212 ft.; this, combined with the fact that it is but one story high and only 32 ft. deep and built of brick and stone, made it subject to strains that might easily have broken the walls. But the building was deposited on its new concrete foundations close by the altered right of way without so much as a crack in the walls. The first step preparatory to moving was to dig down to the bottom of the walls all around and place a heavy wooden framework, reinforced with steel, underneath. By means of jacks the building was then raised up 4 ft. and set on 2-in. steel rollers. The station, which weighs approximately 1,000 tons, was then started forward, drawn by cables which ran through blocks staked to the ground and then wound around a windlass operated by seven laborers. At first it was moved at the rate of 2 in. per minute and later at 6 in. per minute. The movers did not

Railway Station in Danville, Virginia, Which was Moved without being Injured in Any Way in Spite of the Fact That It Is 212 Feet Long, Very Narrow, and But One Story High

The Hull of the Three-Mast Schooner "Great Bear" was Protected with a Sheeting of Ironwood. The Vessel was Considered to be the Stanchest Ice Ship Afloat and Carried the Borden-Lane Expedition Headed for the North to Join Vilhjalmur Stefansson. It was Totally Wrecked on Pinnacle Rock in Bering Sea, but Its Party Reached St. Matthew's Island in Safety and was Subsequently Rescued

have a straight pull, but, because of a near-by building, had to swing one end of the station around 40 ft. before getting a straight course. One more change in direction had to be made to get squarely on the foundation. Pigeons nesting in the depot tower were in no way disturbed by the change.

STEFANSSON SUPPLIES LOST WHEN "GREAT BEAR" SANK

While making its way through a dense fog that shrouded Bering Sea, the three-mast schooner "Great Bear," carrying the Borden-Lane expedition into the far North, foundered on Pinnacle Rock near St. Matthew's Island early in the morning of August 9, last. The vessel, on its maiden voyage and considered to be the stanchest ice ship afloat, was a complete wreck. The entire party, however, with a year's supplies and everything needed for its comfort, reached St. Matthew's Island in safety and 16 days later was picked up and taken to Nome by the United States coast-guard cutter "McCullough."

The "Great Bear" was owned jointly by Capt. John Lane, a well-known seaman, and John Borden, Chicago millionaire and sportsman. It carried provisions for Vilhjalmur Stefansson, the Canadian explorer, and was to have engaged in trading and trapping. Captain Lane is the man who headed the Stefansson relief expedition more than a year ago when the explorer had about been given up as lost. He reached the arctic party, found that one of its ships had been lost, the other disabled, and that supplies were needed. He sold his own schooner, the "Polar Bear," to Stefansson, furnished him with supplies, and left his own party in the North to spend a year trapping and trading. He then made part of his way back on foot and finally took passage for Seattle. He had made an agreement to join Stefansson and get food to him at Herschel Island or Banks Land, some distance from the mouth of the Mackenzie River, this winter. He was also to

pick up his own party. So, upon returning to the United States, he immediately began organizing the expedition which lately came to grief.

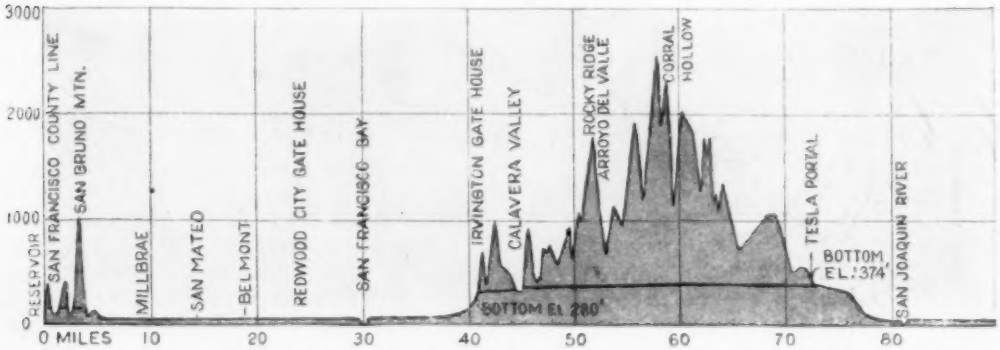
Little has been heard of Stefansson during the past year. Several weeks ago, however, a photographer connected with his party reached Nome with the news that the explorer spent a part of last winter tracing some 200 miles of the shore line along the newly discovered land north of Prince Patrick Land, which is described as greatly like Greenland. The "Polar Bear" was not in the best of condition when it was taken over by Stefansson, and neither are the latter's supplies thought to be abundant. Therefore concern is felt for him and his party in view of the abrupt end of the "Great Bear" expedition.

The wrecked vessel was similar in type to the "Polar Bear," but larger and much stronger. Its hull was 28 in. thick and had an outer armor of Australian ironwood. The vessel cost approximately $75,000 to construct and was equipped with an engine developing 160 hp. It carried 25,000 gal. of fuel.

GREAT HETCH-HETCHY PROJECT UNDER WAY

In the two and more years which have passed since the great Hetch-Hetchy Valley water project was approved by the Federal government, the accomplishments of the engineering forces at work in that region have been sufficient to show in a striking manner the magnitude of this public improvement, which eventually will supply San Francisco and neighboring cities with pure water from a portion of the Yosemite National Park. The task involves making provision to carry water by tunnels, pipe lines, etc., a distance of over 170 miles and the construction of dams, power houses, and reservoirs at enormous cost, as pointed out in Popular Mechanics Magazine in 1914. Work has already begun on the site of the Hetch-Hetchy dam which will have a storage capacity of 112,000,000,000 gal. A tunnel of 20-ft. bore has been driven at the foot of the dam site to divert the Tuolumne River so that the foundations of that barrier can be laid during low water this fall. On the walls of rock which rise precipitously either side of the place where the dam will be built, wide white lines have been drawn to show the exact position it will occupy. To aid in handling the material, a railway will be constructed into the Hetch-Hetchy Valley at a cost of nearly $2,000,000. Later this railway will be dismantled and the roadbed converted into a great scenic highway.

The tunnels which occupy a considerable part of the 166 miles from the Hetch-Hetchy dam to San Francisco are themselves of sufficient magnitude

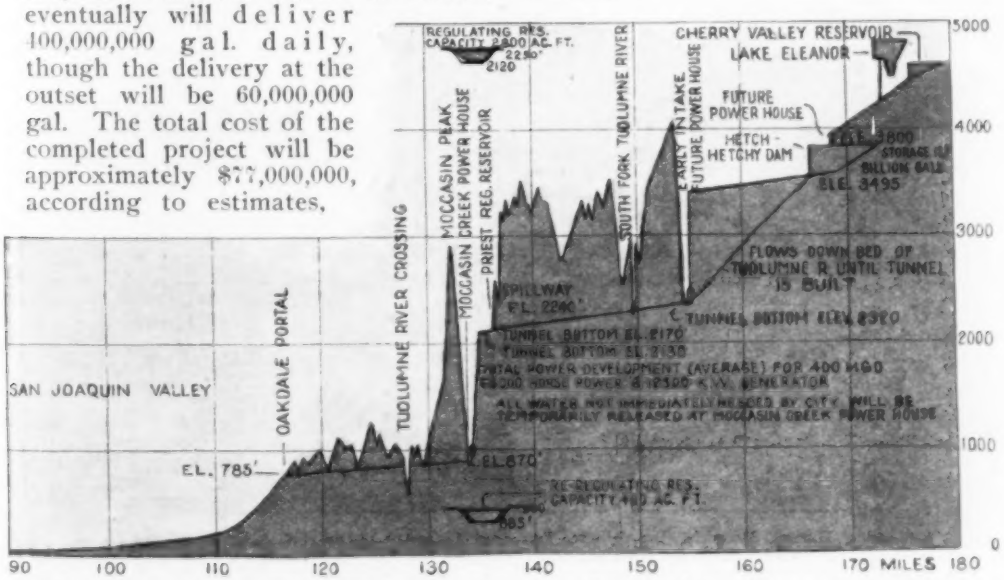


Profile of the Hetch-Hetchy Water-Supply Project, Showing the Location of the Reservoirs, Power Houses,

Looking from Site of Dam in Foreground into Hetch-Hetchy Valley That Eventually will Contain a Water Reservoir

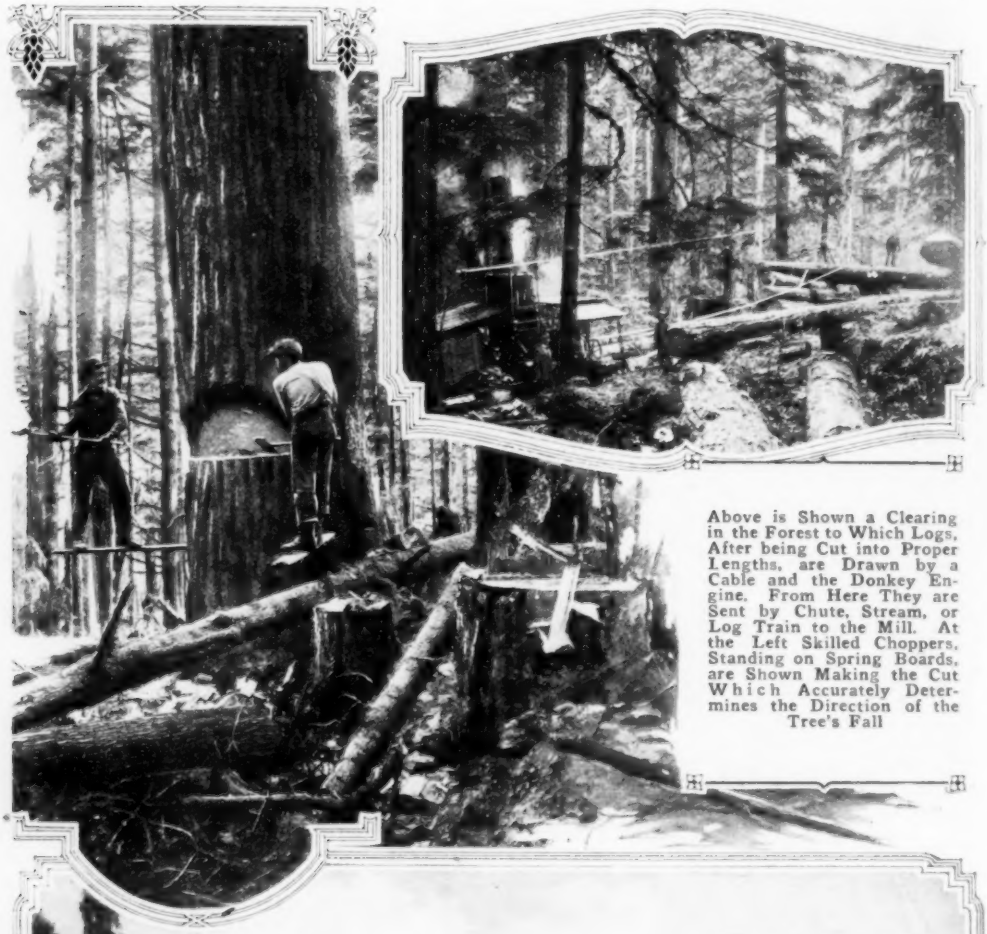
The Future Location of the Dam is Indicated by the Markings on the Rocks

to make this project rank as one of the great engineering undertakings of the country. About 10 miles below the great dam the water will enter a tunnel, 10½ ft. in diameter and nearly 19 miles long. A little farther on will be two more bores, 5¾ and 11½ miles long, respectively. The water will be carried down through the San Joaquin Valley for a distance of 43 miles by a pipe, after which it will rise again and enter a tunnel, 27⅓ miles long. It is estimated that the initial outlay for this great improvement will be $44,000,000. This will build a line which eventually will deliver 400,000,000 gal. daily, though the delivery at the outset will be 60,000,000 gal. The total cost of the completed project will be approximately $77,000,000, according to estimates, and several years will be required to finish it.



Tunnels, and Pipe Lines by Which Water will be Brought to San Francisco a Distance of Over 170 Miles

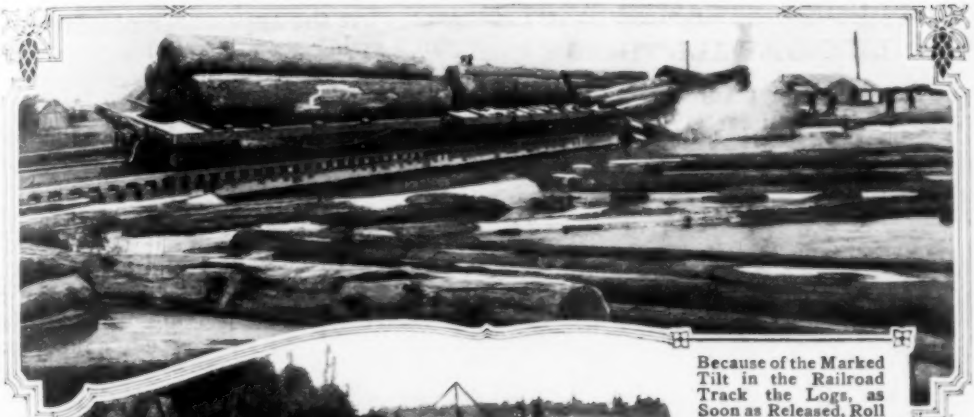
ASPECTS OF LUMBERING METHODS OF TODAY



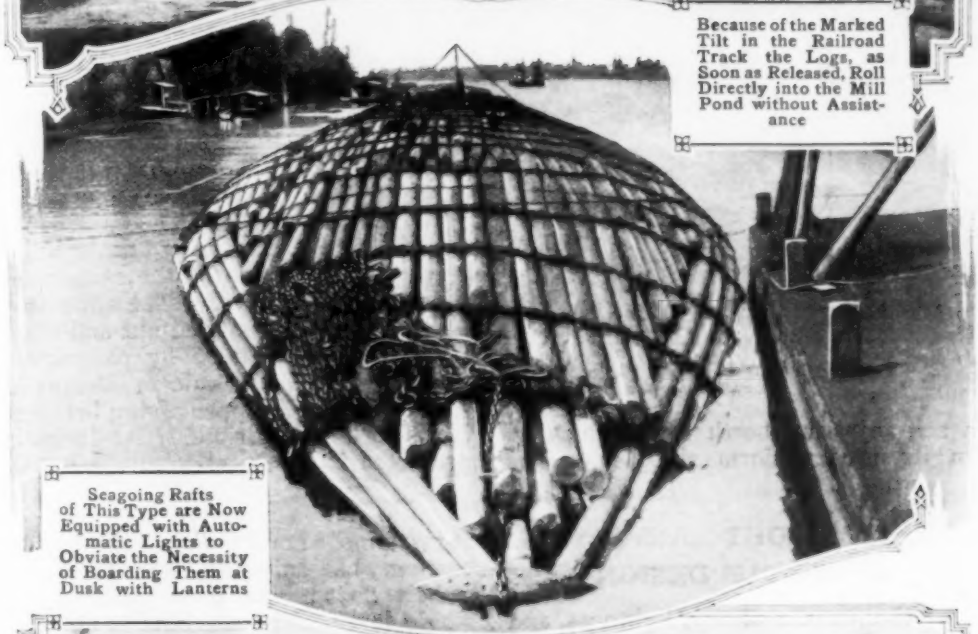
Above is Shown a Clearing in the Forest to Which Logs, After being Cut into Proper Lengths, are Drawn by a Cable and the Donkey Engine. From Here They are Sent by Chute, Stream, or Log Train to the Mill. At the Left Skilled Choppers, Standing on Spring Boards, are Shown Making the Cut Which Accurately Determines the Direction of the Tree's Fall

Horses Deep in the Water Drawing Stranded Logs off Sandbars: This Task Calls for Coolness and Daring on the Part of the Drivers, Who with the Horses are Sometimes Swept into Deep Water by the Swift Current

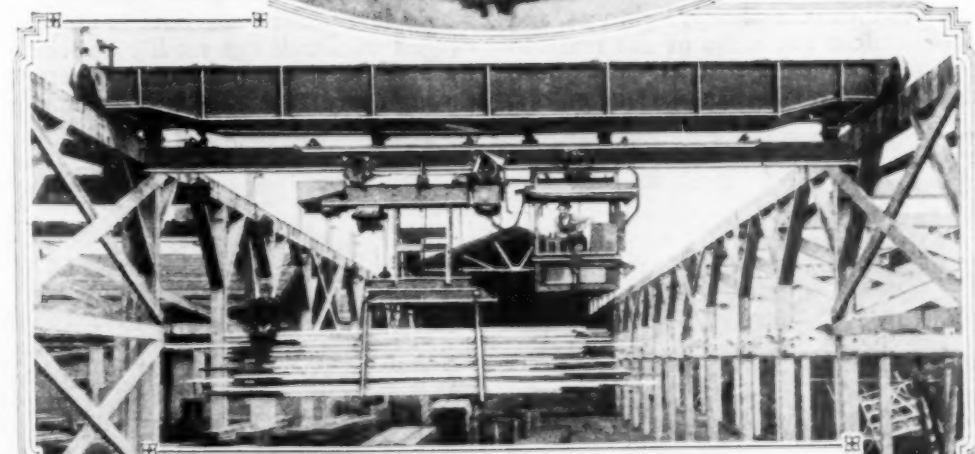
THAT INDICATE BOTH SKILL AND EFFICIENCY



Because of the Marked Tilt in the Railroad Track the Logs, as Soon as Released, Roll Directly into the Mill Pond without Assistance



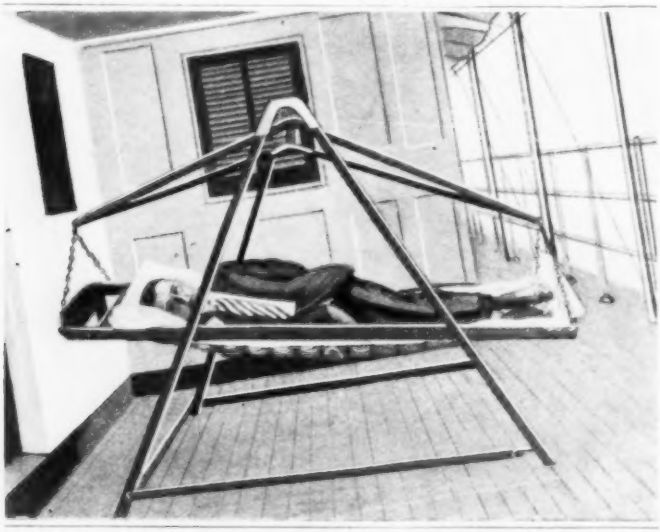
Seagoing Rafts of This Type are Now Equipped with Automatic Lights to Obviate the Necessity of Boarding Them at Dusk with Lanterns



Modern Lumberyard Equipped with Traveling Crane and Monorail Hoist: The Latter can Run Over onto Stationary Rails Shown at Left, between Uprights. By This Means Lumber can be Carried to All Parts of the Yard

SUSPENDED STEAMER BERTH LEVEL AT ALL TIMES

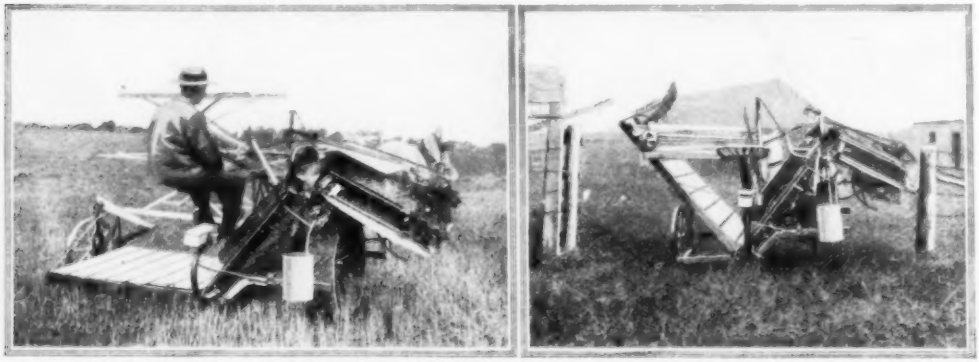
Encouraging tests have recently been made by an eastern inventor with a self-adjusting berth for steamships. In its present form the device has somewhat the appearance of a lawn or porch swing set in a reclining position, but although it might be employed in such capacities it is primarily intended to provide a level, vibrationless bed for steamer passengers. The bunk is suspended at the head and foot from an angular beam which in turn is hung from the crossbar of the supporting frame. The arrangement permits the bed to remain level at all times, regardless of either the longitudinal or lateral motions of a vessel. Furthermore, the vibrations of the engines and propellers are not transmitted to the occupant of the suspended berth. The apparatus was tried out and commended by passengers and officers aboard a steamer plying between New York and Norfolk. The device is protected by patents.



The Berth Adjusts Itself to the Motions of a Vessel, Remaining Level Even in a Heavy Sea

LIGHT-WEIGHT HARVESTER OF SIMPLE DESIGN

Mechanical simplicity, lightness, and compactness are some of the features of a new harvester that has lately been developed by two Missouri inventors. It is composed of less than 125 separate castings, has only one chain instead of a half dozen, and is operated by a single lever. The machine is also arranged so that it can readily be folded by one man to permit its passage through any gate that will accommo-



Two Views of the Folding Harvester, Which Has a Number of Convenient Points in Addition to Being of Simple, Light Construction

date an ordinary wagon. Since the grain board can be slipped out easily, the threading of the binding twine is facilitated. Its standard tread enables the harvester to be driven along country roads without difficulty, the wheels tracking in the ruts worn by wagons. The bull wheel carries a broad tire, while the lightness of the machine enables two horses to pull it over fairly soft fields.

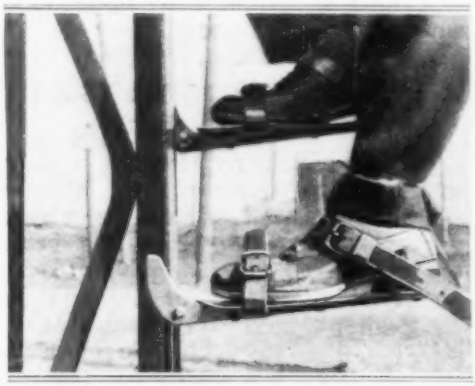
AUTOMOBILE CREEPER HAS CONVENIENT FEATURES

An automobile creeper, which enables one to get under a car with the minimum of inconvenience, is being made by a firm in Covington, Ky. Many garages do not have repair pits and in such cases this low-wheeled platform performs a valuable service when repairs are to be made underneath an automobile. This device consists of a piece of sheet steel measuring 20 by 36 in., curved to fit the back, and mounted on a wooden frame. It is supported by four casters, and at one end is a soft headrest. At the sides are grooves for holding tools, nuts, bolts, etc., which may be needed by the one doing the repairing. The creeper keeps the repairer out of the oil on a garage floor and enables him to move about easily while on his back.

A Headrest and Grooves in the Sides, for Holding Tools and Parts, Add to the Usefulness of This Aid for the Automobile Repair Man

STEEL SHOES FOR CLIMBING STEEL POLES

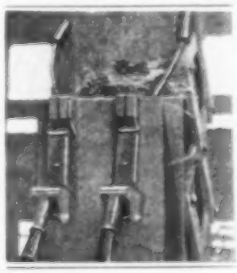
Steel shoes slightly resembling old-fashioned skates, which are to be fastened by straps to a worker's ordinary shoes, enabling him to climb certain types of steel poles, have been invented. The forward end of this steel device projects beyond the foot and curves upward. Extending from the left and right sides, respectively, of the right and left steel shoes are two tool-steel projections, one at the tip of the toe and the other a short distance back of it. In climbing, the wearer fits these projections about the edge of the steel upright to be ascended so that it clamps the shoe firmly in position, as shown. By placing all his weight on one foot the climber can easily release the other shoe and put it in a new position, either higher or lower. These shoes weigh about the same as a lineman's common climbers.



Projections near the Tips of These Steel Shoes Enable the Wearer to Climb Certain Types of Steel Poles with Comparative Ease

ROBIN PICKS QUEER PLACE FOR REARING YOUNG

As an example of how intrepid some of our birds often become in cities, a robin not long ago selected the top of a 200-ampere circuit breaker as a nesting place. The installation is in the noisiest corner of a busy plate shop at a shipbuilding yard. The circuit breaker is supported four or five feet above the ground and ordinarily flashes several times a day. Despite these unattractive features, the robin wove its twig nest without faltering, occupied



it, and since has reared a family of three ravenous youngsters. Undoubtedly the bird had frequented the yard for several seasons, during which time it became accustomed to noises and commotion, and unafraid.

TREE TRIMMER WORKS AT DIZZY HEIGHTS

A task which requires as steady nerves as are possessed by a steeple jack is that which has been assigned to a tree surgeon in Portland, Ore. His contract calls for the removal of all the dead limbs on the trees of Portland's parks. These include several hundred Douglas firs ranging in height from 50 to 200 ft. With ropes and straps he is able to reach places that seem inaccessible, and from the ground it often appears that he rests on very slender support. In the accompanying illustration the tree surgeon is shown on the top of a fir tree 175 ft. high.

¶In 1915 this country exported 398 aeroplanes; in 1914, 40 aeroplanes, and in 1913, only 19. The average value per machine has increased from $3,227, in 1913, to $7,439, in 1915. For the last two years we have imported only one aeroplane each year.

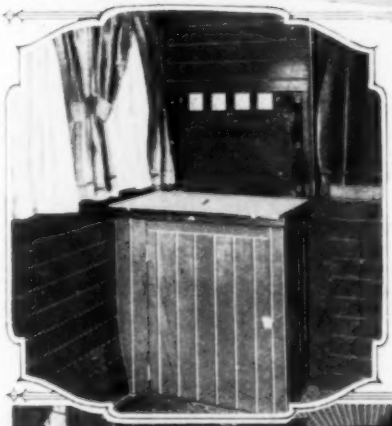
AUTO CHASSIS COVERED WITH PURE GOLD

A well-known automobile firm recently finished one of its six-cylinder chassis, of regulation size and of the most recent design, in pure gold at a cost of $25,000. All told, 350 oz. of the precious metal was used in covering some 3,000 parts. Certain of the smaller parts, such as nuts, were made entirely of gold. The exterior of the engine was finished in the same material. Gold stripes decorated the wheels, which were finished in white enamel. The chassis was made in the factories of the owners and the finishing was done by a firm of locksmiths and metal workers. The smooth gold finish enables one to observe the working of the various parts to advantage. This unusual piece of automobile construction was made for advertising purposes and eventually will be exhibited in the principal cities of America, after which it will be displayed in several automobile centers abroad.

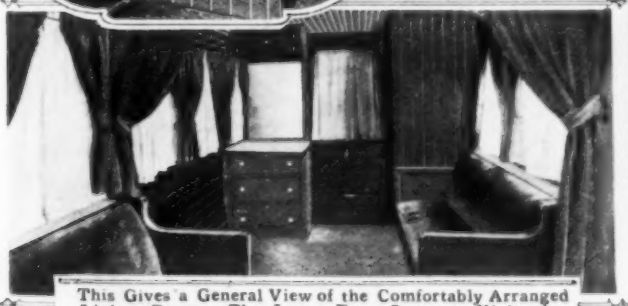
BIG MOTOR SCHOONER USED ON PACIFIC COAST

Overland touring in ease that verges upon luxury is made possible by a comfortably appointed motor recently constructed for a Fresno, Calif., woman who does considerable touring along the coast. The car itself is a standard 2½-ton truck, but the story centers in the body, which is an ingenious and attractively arranged cabin adequate for the accommodation of several persons and suitable for use in any kind of weather. It is 18 ft. in length and a little more than 8 ft. wide. The main compartment, which serves the threefold purpose of a salon, dining room, and bedchamber, is 12 ft. in length. It is entered through a doorway at the rear and lined on all sides by windows. At one end of the compartment there are a built-in dresser, with several drawers, and a clothes closet with shelves and hangers. At the opposite end is a toilet room fitted with washstand, shower bath, linen closet, and

other facilities, and in another corner are provided a sink, combination cabinet, in which dishes and cooking utensils are carried, and a folding table. Electrical devices are used in preparing meals en route, while water is supplied for all purposes by a tank fixed on the roof of the car. Heavily upholstered seats, similar to davenports in size and appearance, are used on opposite sides at the two ends of the living room. These can be converted into large beds and curtains dropped to divide the cabin into two private sleeping compartments. The chauffeur's space at the front of the machine is inclosed likewise, and reached through doorways at either side. The seat used when driving during the daytime opens up, forming a full-length bed. The car is fitted with ventilators and is electrically lighted.



This Big Gray Touring Car, Constructed Especially for a California Woman, is Fitted with Conveniences That Are Comparable to Those of a Private Railway Car. The Interior of the Salon is Finished in Mahogany, While All the Furnishings Are as Comfortable and Attractive as Those of a Well-Appointed Home. The Lighting and Cooking are Done Electrically, While Both Hot and Cold Water Are Available at All Times. At the Left is Shown a Built-In Dresser Provided in One Corner of the Cabinet



This Gives a General View of the Comfortably Arranged Living Room. The Long, Easy Seats at Night Are Converted into Full-Sized Beds and the Compartment is Divided by Curtains

There Is Space Even for a Shower Bath in the Compact Toilet Room. The Car Has Clothes and Linen Closets, Shelf and Drawer Space, a Washstand, Sink, and a Kitchen Cabinet

NEGRO BOYS ATTRACT CROWD TO CANDY-SHOP WINDOW

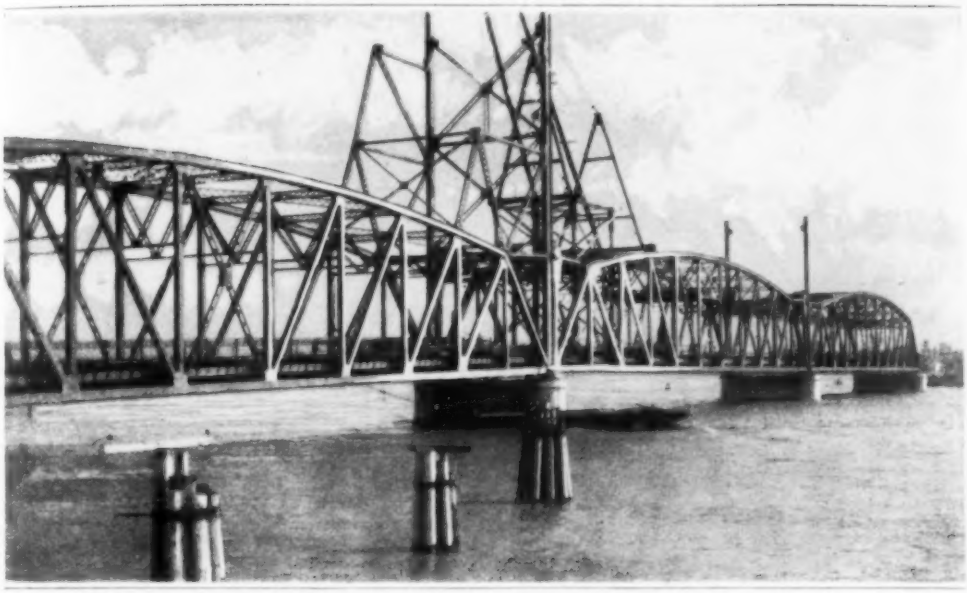
In order to attract the attention of passers-by to their candy shop, a St. Joseph, Mo., firm devised an amusing window display during the city's fall fashion-show week. An abundant quantity of goldenrod was banked against a yellow-satin background arranged in one of the windows. Then a large box with an inclined top provided with six holes just large enough to permit the passage of a person's head, was covered with red satin. Paper cups were fitted around the edge of each hole and the services of a dozen negro boys obtained. These were used in two shifts, six of them sitting in the window with their heads thrust through the holes in the top of the satin-covered box while the other six rested. At the back of the window a placard, bearing the words "Chocolate Drops," was hung. At one time the sidewalk was blocked for three hours.

With Eyes Rolling and Dusky Faces Motionless, the Darkies Blocked Traffic on the Sidewalk before the Candy Shop

SIMPLE CONTROLLING VALVE USED WITH RESUSCITATOR

Some of the crudities presented in certain forms of lung motors, used to induce artificial respiration, have been eliminated by refinements incorporated in a manual instrument of a new type. A controlling valve is provided which may be operated independently of the pump, so that by moving a lever back and forth an attendant obtains uniform inhalation and exhalation. An indicator gauge shows the operator what pressures are being exerted upon a patient's lungs and also tells him the instant the latter attempts to resume natural breathing, which can be accomplished without removing the mask. This control valve is interposed between the pump and mask, and measures, regulates, and registers the pressures of inhalation and exhalation. The volume of air and rate of respiration are controlled indirectly by a patient's lung capacity. When the lever handle is moved to the right, a flow of air enters

Air Pressure and the Rate of Respiration are Not Influenced by This Pump



Three of the 30 Spans of the New Interstate Bridge Which is being Built at a Cost of $1,750,000 to Connect Washington and Oregon. The Bridge Itself Is 5,200 Feet Long and with Approaches It Is About Four and One-Half Miles Long

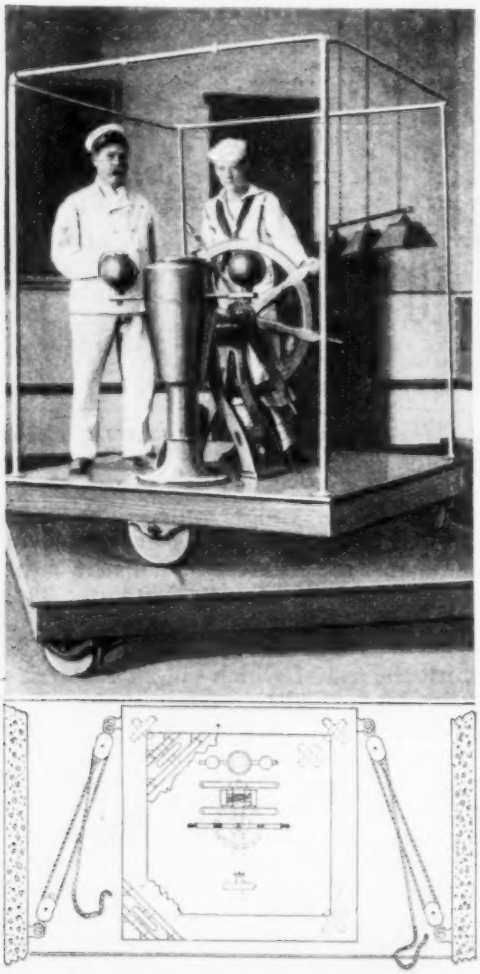
the lungs. As the latter become normally expanded, their resistance is registered, and by noting this, the attendant can tell when to move the lever to the left for exhalation. As this is done the air from the pump escapes through a by-pass and withdraws foul air from the lungs, assisting in their deflation. As the indicator comes to rest, announcing the collapse of the lungs, the operator moves the handle back to the right for the next inhalation. It is even claimed that in case an attendant fails to work the machine in harmony with a patient, the latter can resume breathing of his own accord independently.

INTERSTATE BRIDGE NEARS COMPLETION

The $1,750,000 interstate bridge which spans the Columbia River and connects Clarke County, Washington, with Multnomah County, Oregon, is now nearing completion. The structure, which has been hoped for so many years, is made of steel and is 5,200 ft. long and 42½ ft. wide. With its approaches the bridge is about four and one-half miles long. The steel portion of the bridge is composed of 30 spans, the lightest of which weighs 46 tons and the heaviest 560 tons; 10 of the spans each weigh 465 tons. Included in the design are high towers with the aid of which one of the spans may be opened to permit the passing of boats. The contract for this big engineering task was let in March, 1915, and the date set for its completion was Oct. 31, 1916. A picturesque Indian legend has been handed down from the dim past which says that many generations ago at a point not far upstream from the site of the modern bridge there existed a great natural bridge which was regarded by the dominating tribe of the region, the Willamettes, as a symbol of the permanence of their leadership. Finally an eruption of Mt. Hood destroyed the bridge and, in fulfillment of a prophecy which the legend perpetuated, the Willamettes' power was broken. The general topography of the region and submerged forests give strength to the Indians' tradition that the present structure is a successor of one formed by nature.

APPRENTICE SEAMEN LEARN SHIP STEERING ON LAND

It is not on some vessel, as one might suppose, but on dry land that the art of ship steering is taught boys

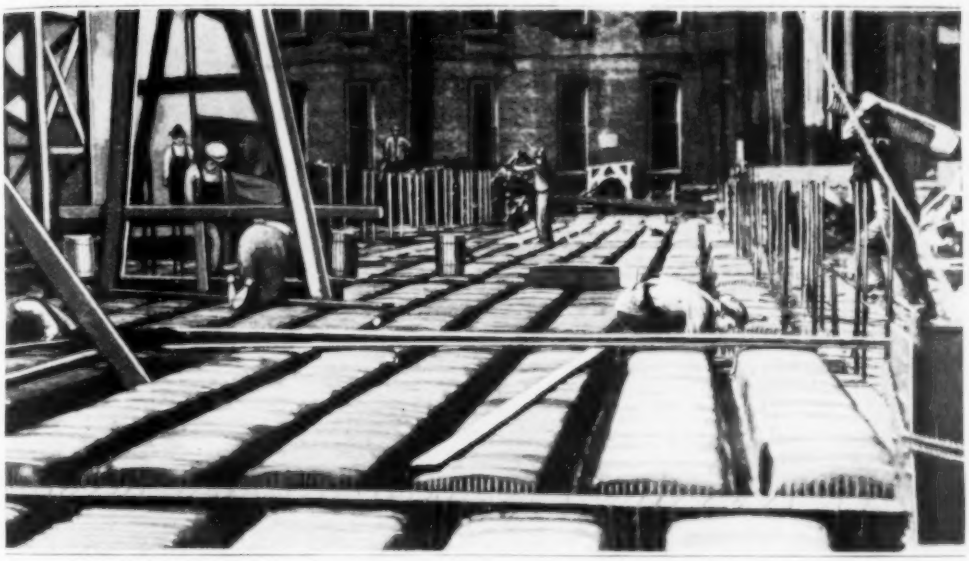


Standard Navy Compass and Steering Wheel, Mounted on Movable Platforms, with Which Apprentice Seamen Learn to Steer a Ship

attending the United States Naval Training School, at Great Lakes, Ill. The apprentice seamen learning to steer use a standard navy compass and a steering wheel mounted on a platform which is supported by three wheels, or rollers, set 120° apart in such positions that the platform can be turned about on a central pivot. Beneath this platform is a second and larger one supported by four rollers which permit it to revolve in the same manner. An oscillating motion is imparted to the platforms by means of two tackles, rigged at opposite corners of the lower platform. By drawing on one and then on the other of these tackles, a motion not unlike the yawing of a ship is produced. The problem of the apprentice is to keep the upper platform in a certain "course" by watching the compass and turning the wheel. The latter controls one of the three upper rollers by an endless cable, which passes over a drum on the axle of the steering wheel and over a drum on the axle of the roller. Consequently the steering wheel swings the upper platform about, just as a change in a rudder's position swings a vessel about. On a battleship six turns of the wheel are required to bring the rudder "hard over." This apparatus is geared similarly.

WEIGHT IN CONCRETE FLOOR LESSENED BY STEEL FORMS

In reinforced-concrete floor construction it is claimed that several advantages attend the use of hollow pressed-steel forms. These patented forms are provided in short lengths and are fitted together in long rows. Reinforcing rods are placed across and between them, and the concrete then poured. A series of T-beams is thus formed which carry the load directly to the supports. Dead weight is lessened, cost reduced, and the work expedited. Metal lath is attached to the under side of the forms so that a smooth ceiling is provided, and the steel is protected against corrosion when plaster is applied. This also leaves air spaces between the floor proper and the ceiling so that the construction is soundproof. Since heavy masses of concrete are replaced by the light forms, considerable reduction in the weight of the supporting columns and girders is permitted. The plan also enables long spans to be used without necessitating



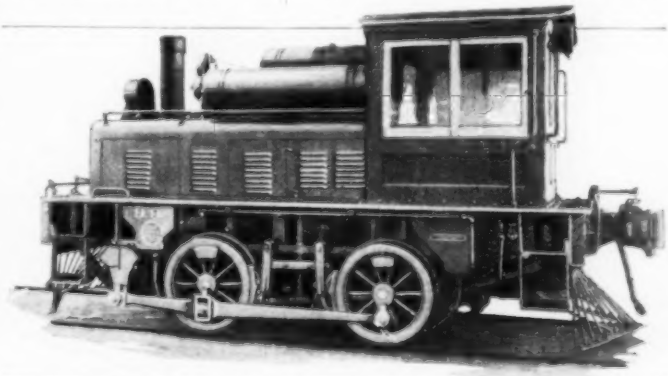
Rigidity, Strength, and Lightness are Attained in Concrete Floors by the Use of Pressed-Steel Forms Which Facilitate Construction and Lessen Dead Weight

the employment of intermediate beams. Office buildings, hotels, and apartment houses, in which normal loads are carried and soundproof floors and flat ceilings desired, are particularly suited for this type of construction.

NARROW-GAUGE GASOLINE ENGINES FOR RUSSIA

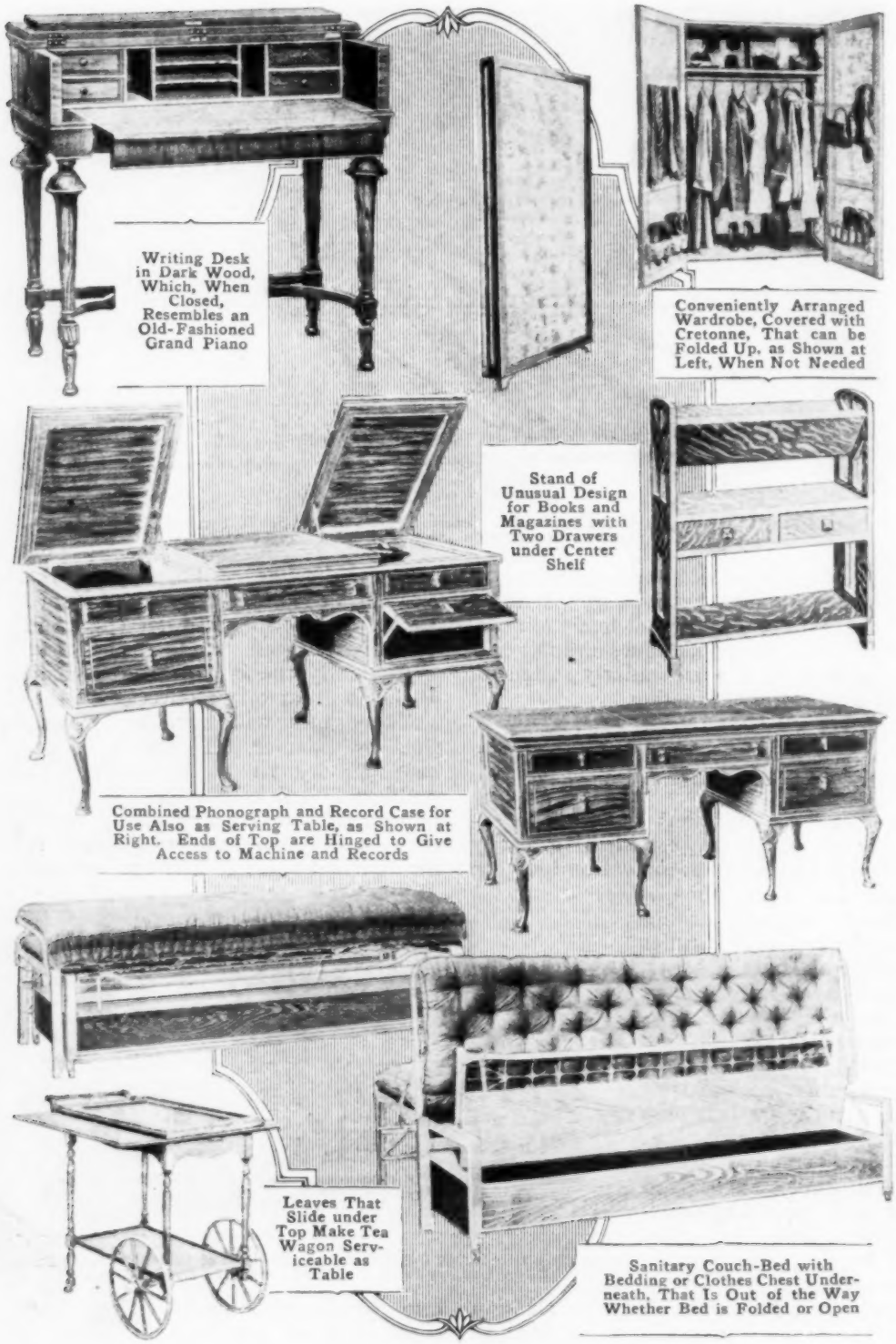
That the Russians have made extensive plans for establishing easily adjustable rail communication between various divisions of their fighting armies and between the armies and the supply bases, is shown by the fact that the Russian government has ordered 350 liquid-fuel locomotives of a special type from a Philadelphia locomotive works. These tractors weigh 7½ tons each and run on tracks approximately 29½ in. wide. These narrow-gauge tracks can be moved about easily. According to Russian officials the engines may be used in the trenches as well as at the rear. Each has a pulling capacity of from 25 to 50 tons, depending on the condition of the track.

Evidently the intention is to utilize Russia's great oil resources, for these little engines will burn either gasoline or heavier oil having a specific gravity as high as .77. The builders find that they can operate the motors with this heavy oil by raising the compression and readjusting the air and fuel valves. The engines have two speeds, high speed being about eight miles an hour.



Type of Narrow-Gauge Gasoline Locomotive, 350 of Which are being Built in This Country for Use at the Rear of the Russian Front

ATTRACTIVE FURNITURE IN NEW DESIGNS



Writing Desk in Dark Wood, Which, When Closed, Resembles an Old-Fashioned Grand Piano

Conveniently Arranged Wardrobe, Covered with Cretonne, That can be Folded Up, as Shown at Left, When Not Needed

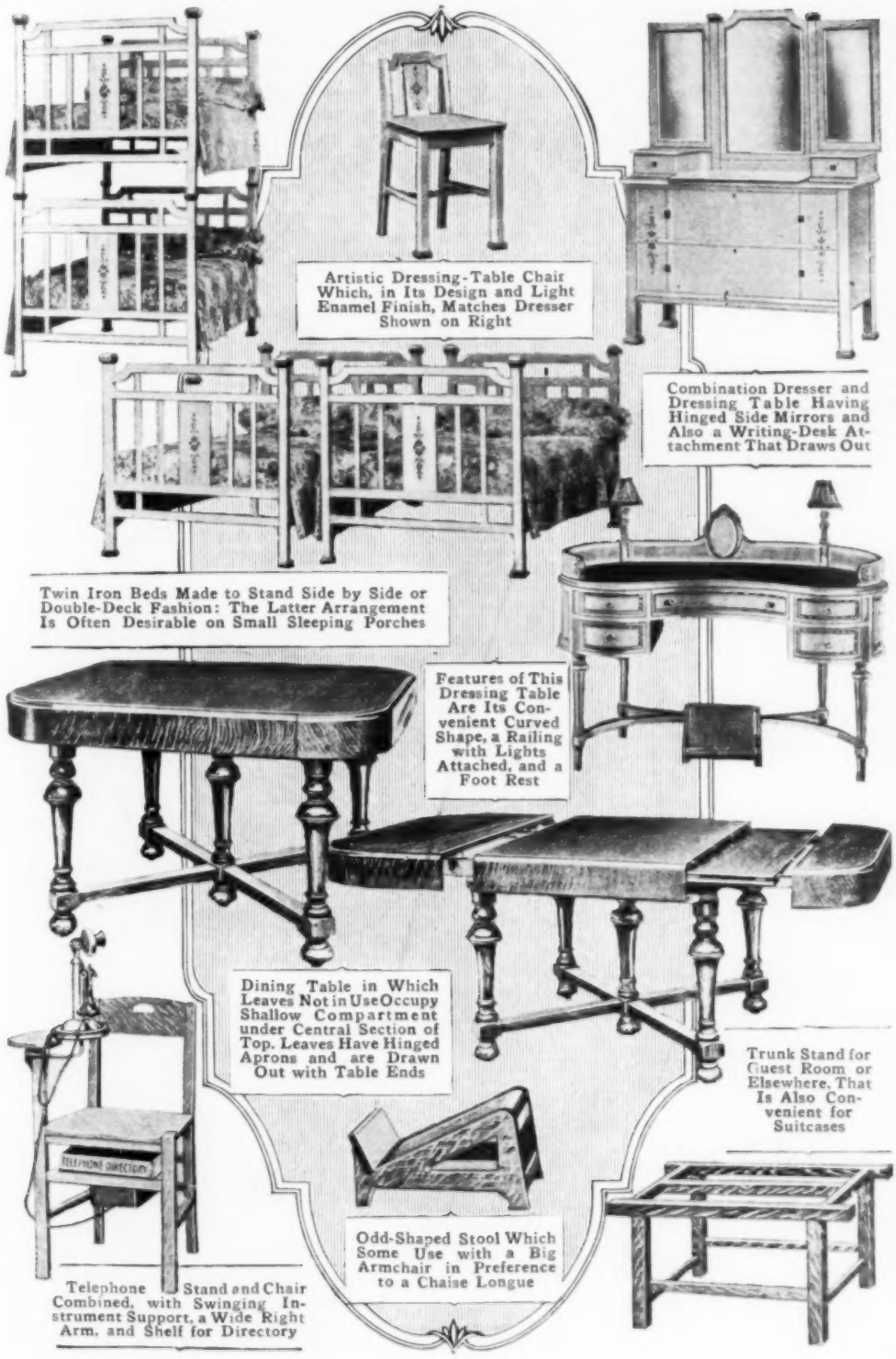
Stand of Unusual Design for Books and Magazines with Two Drawers under Center Shelf

Combined Phonograph and Record Case for Use Also as Serving Table, as Shown at Right. Ends of Top are Hinged to Give Access to Machine and Records

Leaves That Slide under Top Make Tea Wagon Serviceable as Table

Sanitary Couch-Bed with Bedding or Clothes Chest Underneath, That Is Out of the Way Whether Bed is Folded or Open

ADAPTED TO NEEDS OF THE MODERN HOME



Artistic Dressing-Table Chair Which, in Its Design and Light Enamel Finish, Matches Dresser Shown on Right

Combination Dresser and Dressing Table Having Hinged Side Mirrors and Also a Writing-Desk Attachment That Draws Out

Twin Iron Beds Made to Stand Side by Side or Double-Deck Fashion: The Latter Arrangement Is Often Desirable on Small Sleeping Porches

Features of This Dressing Table Are Its Convenient Curved Shape, a Railing with Lights Attached, and a Foot Rest

Dining Table in Which Leaves Not in Use Occupy Shallow Compartment under Central Section of Top. Leaves Have Hinged Aprons and are Drawn Out with Table Ends

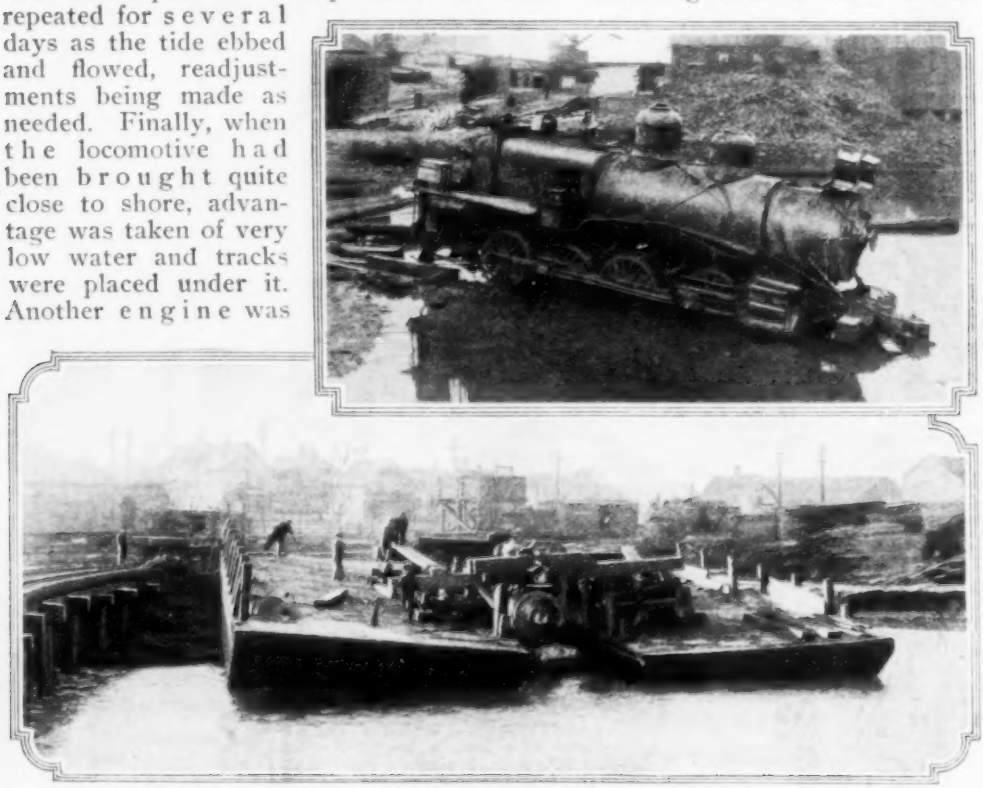
Trunk Stand for Guest Room or Elsewhere, That Is Also Convenient for Suitcases

Odd-Shaped Stool Which Some Use with a Big Armchair in Preference to a Chaise Longue

Telephone Stand and Chair Combined, with Swinging Instrument Support, a Wide Right Arm, and Shelf for Directory

TIDE AIDS IN RECOVERING SUBMERGED ENGINE

The tide proved a better agency than cranes in rescuing a big freight locomotive which recently plunged into False Creek at Vancouver, B. C. The accident occurred when the engine was driven onto a bridge, the span of which was open. Fortunately the engineer and fireman escaped injury. After cranes had failed to raise the submerged engine, a big scow was placed either side of it. Extending from one scow to the other above the engine were heavy, reinforced beams supported by falsework. To these the engine was secured when the water was low. As the tide raised the water in the creek the engine was lifted with the scows, which were then drawn as close to shore as the position of the load would permit. This process was repeated for several days as the tide ebbed and flowed, readjustments being made as needed. Finally, when the locomotive had been brought quite close to shore, advantage was taken of very low water and tracks were placed under it. Another engine was then coupled to it and the load was drawn up the bank and to the shops, where repairs were made. Over six weeks elapsed between the date of the accident and the placing of the engine back on the rails.



Upper View: Partly Submerged Engine near the Shore of the Body of Water into Which It Plunged through an Open Bridge. Lower View Shows How the Engine was Supported by Scows. As the Tide Rose the Scows were Gradually Drawn Nearer Shore

SEVERE PRUNING BENEFITS ROSE BUSHES

To cut roses in the wrong way is to diminish by a large percentage the number of desirable blossoms which bushes will produce. On the other hand, to do what may appear to be a rash thing and cut back most of the new growth, is most beneficial. The Department of Agriculture in explaining this point, particularly with regard to rose plants grown for flower production, declares that when a rose is cut, only two or three eyes of the current season's growth of that branch

should be left on the plant. This will, of course, give the roses very long stems. Succeeding blossoms should be cut close to the ground. This may seem almost like destroying the bush, but it will be found to produce the best roses. If spring pruning is not sufficiently severe, long, naked stalks with short-stemmed flowers will result. Then only one or two strong leaf buds should be left on the branch when a flower is cut, so as to stimulate growth at the base of the plant.

ELECTROMAGNET USED TO BREAK LAMP FILAMENTS

Because discarded electric bulbs with partly destroyed filaments sometimes find their way back into service and eventually cause dissatisfaction, an electric-light company in Boston has constructed a magnetic device which completely shatters the filaments of discarded lamps. It consists of a powerful electromagnet with a U-shaped core wound with copper wire. The lamps are placed in a quick-acting socket between the legs of the magnet. This socket is supplied with 220 volts, alternating current, which passes through a resistance. The resistance is provided to prevent the flow of too strong a current should the base of the bulb prove defective or in case a short circuit develops in breaking the filaments. When the lamp has been put in the socket the direct current is left on continuously in the magnet winding. The filaments are almost instantly shattered as soon as the current passes through them, because of the violent action of the magnetic flux.

BALLOON PATCH SUPPORTS SIX PERSONS

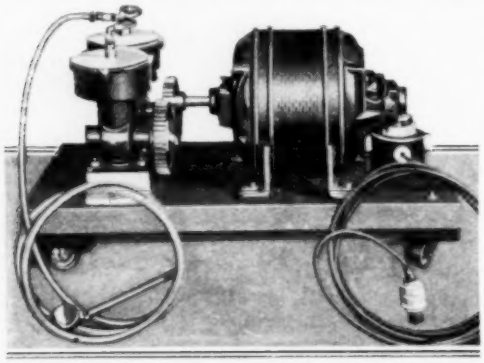
The care which is exercised to give a wide margin of strength to those parts of a balloon that are subjected to stress, is well illustrated by the manner in which the patches for kite balloons of a certain make are constructed. Each of these huge gas bags has 20 patches which are attached to ropes that support the basket. To fasten a rope to the balloon fabric it is separated into its four strands and then frayed

A Balloon Patch being Tested for Its Strength: In Actual Service It Has to Bear Only a Small Fraction of This Weight

out. The frayed portions are then sewed to the fabric, after which another layer of the material is cemented over it. The basket which is suspended from these ropes is designed to carry two persons and yet, so strongly are the patches made, one of them will support six people without tearing, as shown in the illustration. Combined, the 20 patches have a lifting capacity of 10 tons.

TIRE PUMP THAT DELIVERS COOL OIL-FREE AIR

A new type of air pump has been patented recently which is designed to inflate automobile tires with air that



Tire Pump Which Fills a Tire with Cool Air That Is Wholly Free from Oil, and So Prolongs the Life of the Rubber: The Pump may be Made with One Instead of Two Units

is cool and free from oil. It is a well-known fact that many tires are injured by oil pumped into them when they are being inflated. This pump may be operated by the car engine or by a special motor. It consists of two cylindrical sections, the lower of which contains a cam, driven by the motor through gearing, and lubricating oil, while the upper part contains a flexible chamber made up of two concave disks of rubber and fiber, the edges of which are bound together. This flexible disk is expanded and compressed by the motion of the cam rod, which is in the form of a spring-controlled plunger, that runs on a ball-bearing roller. This operation draws air into the disk from the other part of the upper section and then forces it through a spring valve at the top of the pump into the tire. The housing containing oil is wholly separated from the air chamber and so the air does not come in contact with any oiled surfaces nor does it become heated by the parts made hot by the friction.

¶The rabies epidemic, which is being carried by infected coyotes, is spreading eastward in Utah.

ODD MISHAP CAUSES WRECK OF RAILWAY DUMP CAR

Quite a peculiar circumstance caused a contractor's dirt-handling car to be thrown from a railway track down a 20-ft. embankment when its load was being discharged. The car is of the type that is dumped by means of air pressure applied from the engine cab, the floor being arranged to tilt at a sharp angle while the sides are simultaneously raised. It had been loaded with clay compressed into large, solid lumps by a clam-shell shovel. As the bed of the car was tilted a number of these clods lodged against one of the upraised sides and prevented much of the dirt from slipping out. This caused the weight of the sliding load to be thrown against the lower, inclined side of the car with sufficient force to jerk it from the track and hurl it down the grade.

When the Weight of Part of the Load was Thrown against the Lower Side of the Inclined Car, the Latter Left the Track and Rolled down the Embankment

Maintaining the World's Largest Aquarium

by Stanley W. Todd

The New York Aquarium is Situated in an Old Building of Limited Capacity, Erected at Battery Park in Colonial Days as a Fortification. More than 5,000 Live Specimens of Fresh and Salt-Water Fish, Reptiles, and Invertebrates of Various Species Gathered from All Parts of the World are Exhibited

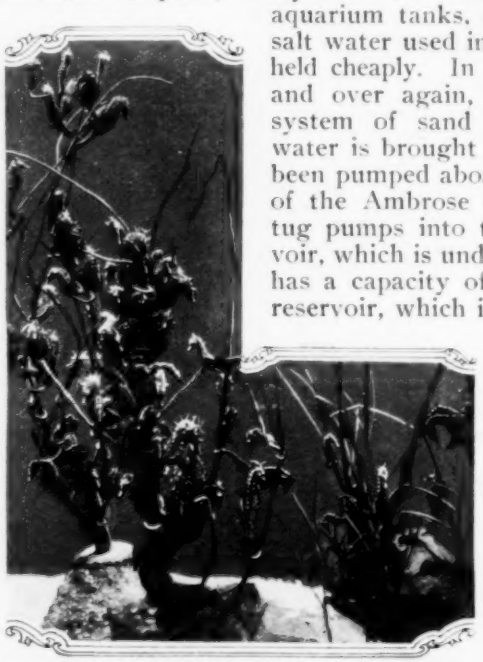
COMPARATIVELY few of the 2,000,000 people who each year visit the New York Aquarium at Battery Park, New York City, realize what mechanical difficulties are involved in maintaining it. Although housed in a structure that is one of the oldest in the city, having originally been built as a fortification in colonial days, this aquarium is the largest in the world. It is famous for its collection of rare fish specimens and other forms of aquatic life, kept alive and flourishing in tanks in full public view. The institution is conducted by the city under the supervision of the New York Zoölogical Society, a representative civic organization, which also controls the zoölogical exhibits at Bronx Park.

The capacity of the New York Aquarium, which is handicapped by an inadequate building, has always been taxed to its maximum, approximately 100 tanks being all it can accommodate. Yet there are at present 5,688 specimens of all kinds in the building, representing 200 species. This includes 3,186 fishes, representing 140 different species; 95 aquatic reptiles, of 23 species; 166 amphibians, of 14 species; three aquatic mammals, of two species, and 2,338 invertebrates, of 21 species. So far as the visitor can see, these are kept in two galleries of glass-fronted tanks, with the sunlight illuminating them from above, and a number of larger open pools on the ground floor for the biggest specimens, like the porpoises, sea lions, drumfish, groupers, alligators, and tortoises.

Specimens are Transported by Ship in Wooden Tanks to the Aquarium and Unloaded in the Manner Shown Here. The Water is Changed Regularly during the Trip and the Fish are Fed Carefully

But when the visitor goes "behind the scenes," he comes to realize that, in the maintenance of a large aquarium, eternal vigilance is imperative.

Every one of 100 exhibition tanks, each crowded with live specimens, must be watched so that nothing will occur that may endanger the lives of the fish. As both fresh and salt-water fish are kept on exhibit, their natural element must, of course, be provided. Besides, the water must be at just the proper temperature at each season of the year; the different species must be fed at regular intervals in quantities that will not permit them to overeat; the food must be scientifically correct and be cut into pieces to fit mouths of varying sizes. It is an operation that must be kept up incessantly. Improper food or stagnant water would kill the specimens in an incredibly short time. Aquarium machinery is used continuously.



Seahorses Are Particular about Their Diet and Die within a Short Time Unless Plenty of Gammari are Provided for Them. In Any Event They Rarely Live in Captivity More than a Year

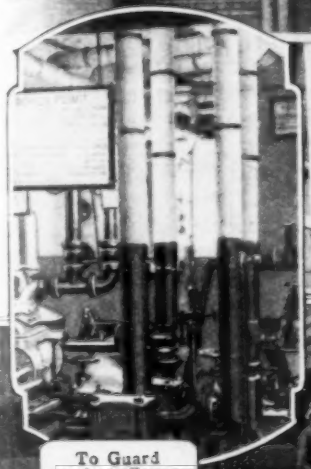
Each of the small exhibition tanks on the upper and lower galleries is more or less independent; it has its own inflow and outlet. In order to maintain both salt and fresh-water specimens, two separate piping systems are necessary. The salt-water tanks are concentrated on one side on both galleries; the fresh-water tanks on the opposite side. In addition, there are what might be termed "cold-water fish," like salmon, trout, and whitefish, that require a temperature of 54°. On the other hand, the tropical fish which comprise most of the rarer specimens must have a much higher temperature. To accomplish this, the aquarium is provided with a water-cooling plant, which is in continual operation during the summer months; a water-heating outfit that is used chiefly in winter; an aërating equipment that is kept in readiness for emergencies. These are exclusive of the various water pumps which fill the big tank reservoirs and filters on the upper floors of the building.

The waters of New York Bay are polluted to a certain extent. At least, they are not sufficiently pure for the aquarium tanks, and as a result the salt water used in the building is not held cheaply. In fact, it is used over and over again, with the aid of a system of sand filters. Clear salt water is brought in by a tug, having been pumped aboard the boat outside of the Ambrose Channel. This the tug pumps into the aquarium reservoir, which is under Battery Park and has a capacity of 100,000 gal. This reservoir, which is covered by shrubbery, and is therefore unknown to the thousands that each day throng the park, is divided into four equal compartments, all of reinforced concrete, with a valve pit in the center and an equalizing device that controls the selection of the compartment from which the water is to be pumped.

There is a reason for this selection, as will be seen in a moment. The pump which draws the water from the reservoir is made entirely of bronze, thus avoiding any corrosion that might come by the action of salt on the ordinary metal pipe. The stored water is pumped into two large equalizing filter tubs on upper floors, and the exhibition tanks are fed from this supply. Hard-rubber pipes convey the water as an additional preventive against corrosion. The outlets from the small tanks flow into a pipe that leads to the sand filters in the basement, which are higher than the Battery reservoir. The filtered water thus returns to the

A Tortoise with Seating Capacity for Four or Five Sturdy Boys. These Big Fellow Live for Generations and Always Interest Visitors

Porkfish with Black and Yellow Stripes. They are Obtained in the West Indies



To Guard against Corrosion, This Pump Which Draws the Salt Water from the Reservoir, is Built Entirely of Bronze

Salt Water is Pumped from a Large Reservoir to These Equalizing Filters from Which the Exhibition Tanks are Supplied from Time to Time as Is Necessary

Spadefish in One of the Glass-Walled Exhibition Tanks at the Aquarium

The Fish Obtained from the Vicinity of Bermuda are Cared For in Tanks Kept Fresh by an Influx of Sea Water. Late in the Year When the Water Becomes Too Cool for Them, Aëration is Resorted to

PHOTOS BY COURTESY OF THE N. Y. ZOOLOGICAL SOCIETY

reservoir, to be deposited in another compartment and to be used when occasion requires.

In obtaining a fresh-water supply, the city water suffices. It flows into large reservoir tubs, furnishing a strong head for a proper flow by gravity to the fresh-water tanks, the overflow of which is allowed to go into the sewer. The water-cooling and water-heating apparatus are connected up with both systems, and the engine room is able to provide the proper temperatures, which are maintained according to a scientific schedule. The floor pools, in which the largest specimens are kept, used harbor water until it became so bad that Dr. Charles H. Townsend, the aquarium director, installed a filter system for them, by rearranging his equipment.

The problem next in importance is, perhaps, the feeding of the fish. It is a task involving no small amount of labor and expense. In fact, one attendant, who is called "the chef" and has a "kitchen" set aside for this department, devotes his entire time to the preparation of the food. The majority of the fish are fed three times a week—Mondays, Wednesdays, and Fridays. The actual feeding is done by two men who are known as "feeders," one taking charge of the salt-water section and the other of the fresh. They are also charged with the care of the fish during the day, seeing that the temperatures are properly maintained and making alterations and repairs when necessary. For extensive repair work, the aërating machine is put into action, and on one occasion the aquarium tanks were maintained for an entire week through aëration while a new piping system was being installed.

The food for the aquarium fish consists chiefly of meat, fish, clams—sliced, chopped or minced, as may be necessary to suit the size of the specimens. The whole collection is fed carefully in order that there may not be an unnecessary amount of food left unconsumed, which would have to be removed to prevent its affecting the water.

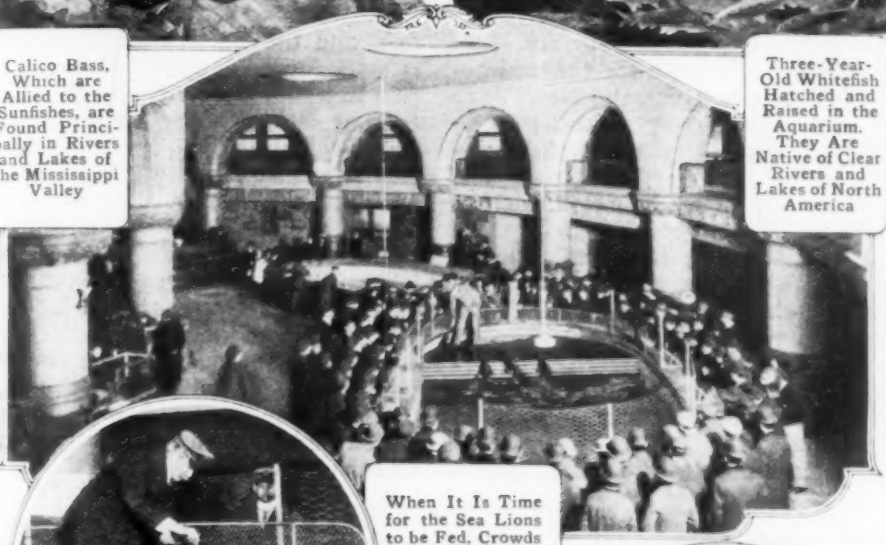
Only the freshest of market food can be used. Cod, herring, smelt, beef, liver, and clams are purchased each week in large quantities, and the food bill, which varies according to the season, sometimes runs up to $150 a month. The quantities which the larger specimens require are astonishing. Porpoises, which do not survive very long in captivity and are so large that the average aquarium cannot keep them, consume about 30 pounds of herring a day. The sea lions, sea turtle, alligator, crocodiles, sturgeons, large jewfish and drumfish also require food in substantial quantities. Large supplies of live food are brought in from adjacent bays and shores by the aquarium collector. These comprise chiefly minnows, shrimps, mussels, crabs, marine worms, small soft clams, and beach fleas. More or less live food is kept on hand in reserve tanks, being used to advantage particularly in summer. Minnows, shrimps, mussels, small crabs, and the like, are used by the thousands. Angleworms, obtainable in the park in summer, are convenient food for the fresh-water fishes.

The interesting little seahorses, usually to be found at the aquarium, can be kept to good advantage only when they are well supplied with Gammarus, a very minute crustacean, secured by gathering bunches of fine sea moss, which they inhabit. Even under the best conditions, it is difficult to supply the seahorses with sufficient variety of the live food required, and the best specimens have seldom lived longer than a year. The seahorse tanks are cleaned as seldom as possible in order not to disturb the colonies of Gammarus forming there.

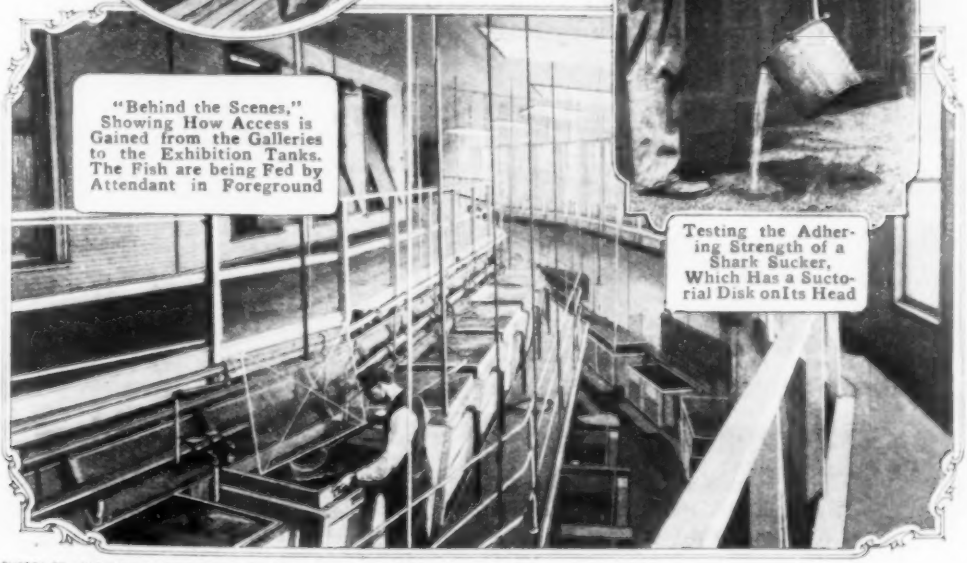
The feeding of the larger specimens in the tank pools is an operation that always interests visitors to the aquarium. The feeding of the exhibition tanks on the two galleries, however, is carried on practically without the knowledge of those watching the fish from the inside. The sunlight, shining on the tanks "behind the scenes," illuminates so that the colors of the fish, particularly the unique tropical forms,

Calico Bass, Which are Allied to the Sunfishes, are Found Principally in Rivers and Lakes of the Mississippi Valley

Three-Year-Old Whitefish Hatched and Raised in the Aquarium. They Are Native of Clear Rivers and Lakes of North America



When It Is Time for the Sea Lions to be Fed, Crowds of Visitors Always Gather around the Open Tank and Watch the Feast. The Insert Shows a Keeper Feeding a Pair of the Creatures



"Behind the Scenes," Showing How Access is Gained from the Galleries to the Exhibition Tanks. The Fish are being Fed by Attendant in Foreground

Testing the Adhering Strength of a Shark Sucker, Which Has a Suctorial Disk onIts Head

PHOTOS BY COURTESY OF THE N. Y. ZOOLOGICAL SOCIETY

are brought out in all their gorgeous beauty. But the surface of the water, viewed from underneath, has the effect of an opaque silver covering, and the feeder standing just above the tank is invisible to the visitor below, nor is the act of feeding discerned until the food is thrown into the water or the feeder puts his hand below the surface.

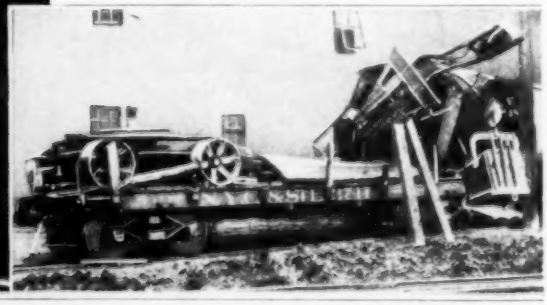
While the city pays for the maintenance of the aquarium, the New York Zoölogical Society, by whose permission the accompanying photographs are published, buys its own specimens or receives them by donation. Thus, during last year, 914 specimens were bought for the aquarium, while during the same time 476 were donated. Together, some 1,390 specimens were received during the year. Despite all the precautions taken, there is a certain amount of loss among the specimens, due chiefly to parasites or to overfeeding.

An interesting feature of the aquarium exhibits are the fish hatcheries. Trout, salmon, perch, whitefish, and smelt are developed from eggs and young fry donated by the United States Bureau of Fisheries, with which the aquarium works in constant coöperation. It is possible for students to watch the entire life history of the fish, and the Battery Park institution is constantly being asked for information in its particular field. From three to four million eggs are hatched out each year, the young fry being used to stock the lakes in city parks and other local bodies of water. Part of them are turned over to the State Conservation Commission for distribution to rivers, lakes, and small streams in different parts of the state. Some of the fish in the exhibition tanks were raised from eggs hatched out in the building. While it is difficult to place a value on the entire collection, it has been estimated that it could not be replaced for less than $10,000.

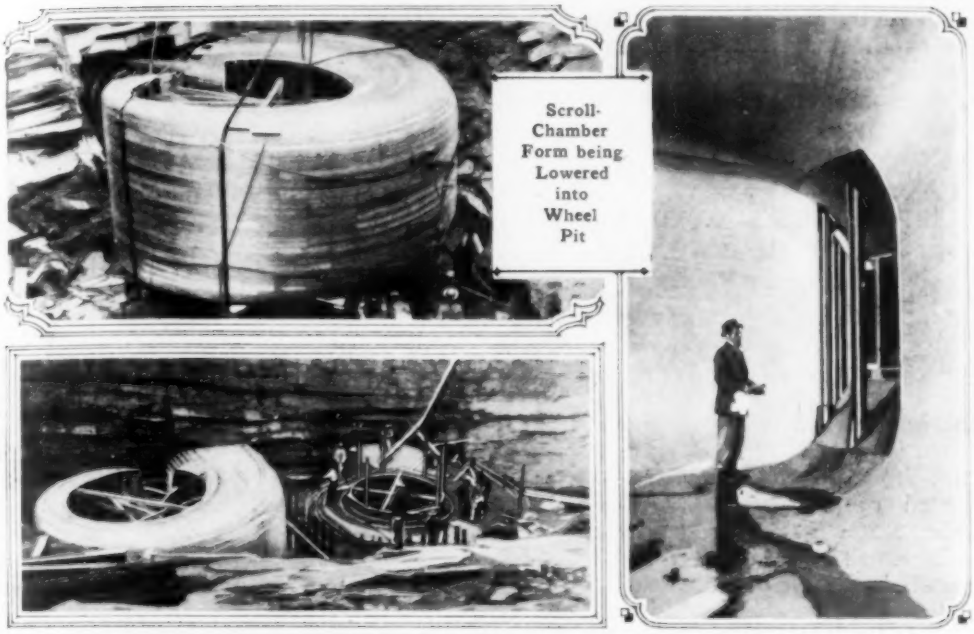
CRASH DAMAGES STEEL MORE THAN CONCRETE

Some evidence of the great strength of structural steel incased in concrete is found in the results of an accident which occurred recently at Detroit Avenue bridge, Cleveland. The bridge clears railroad tracks beneath it by less than 13 ft. In loading a steam shovel on a flat car to ship it through Cleveland and beyond, proper care was not taken to provide sufficient vertical clearance. Consequently, when this car passed beneath the bridge mentioned, the boom struck the concrete structure, skewing the shovel about and jamming it into very narrow space. The train broke in two. The heavy steel shovel was badly wrecked, while the bridge, which is of steel incased in concrete, was little more than scratched, on its uprights and near the level of the bridge floor.

The Slight Damage Done to the Bridge is Shown Above. Some of the Concrete was Scraped Away Immediately above the Right-Hand Track Also



Right: A Steam Shovel Which was Badly Wrecked by Colliding with a Bridge in Cleveland, Made of Steel Incased in Concrete



Left: Pouring Concrete about One Form and Lowering Another Huge Snail Shell into Place.
Right: Finished Interior of Concrete Scroll Chamber After Form had been Removed

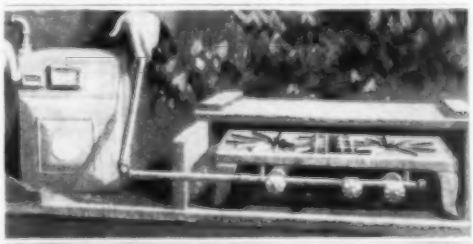
BIG TURBINE FORMS LOOK LIKE HUGE SNAIL SHELLS

The building of two movable scroll chambers, that resembled gigantic snail shells, was one of the unusual features involved in the construction of the concrete tubes that conduct water from the headwaters to the turbine wheels of a new power plant. The site of the power plant had to be excavated from the solid rock and if the builders had waited until the pits for the turbine wheels had been made ready, before beginning the forms for the scrolls, considerable time would have been lost. Consequently they built the forms in advance and lowered them into place when the pits were ready. The mouth of one of these huge "shells" measured 12 by 12 feet.

¶Tourists in the national forests who enter their names and destinations in the registers, which are provided in many instances, can make arrangements to have telegrams, etc., forwarded to them by the forest rangers.

COIN-OPERATED GAS METER AND STOVE IN PARK

Because most people feel that a cup of hot coffee, or other warm beverage, adds as much to a picnic dinner as to any other meal, the authorities in charge of the park at Redlands, Calif., have provided a gas plate for picnickers, which secures its fuel through a coin-operated meter. The meter stands on the table which supports the plate, and is made with a slot in its front side. By depositing the proper coin in the slot, gas is permitted to flow through the meter for a short period of time, after which the fuel is



A Gas Stove for Picnickers: By Depositing a Coin in the Meter Gas is Permitted to Flow for a Short Time

cut off by a clockwork device. Thus at small expense persons enjoying an outing are able to make coffee or do the small amount of cooking that might be desirable in preparing to serve a picnic dinner.

SPIKES OF NEW HARROW SET IN ROLLERS

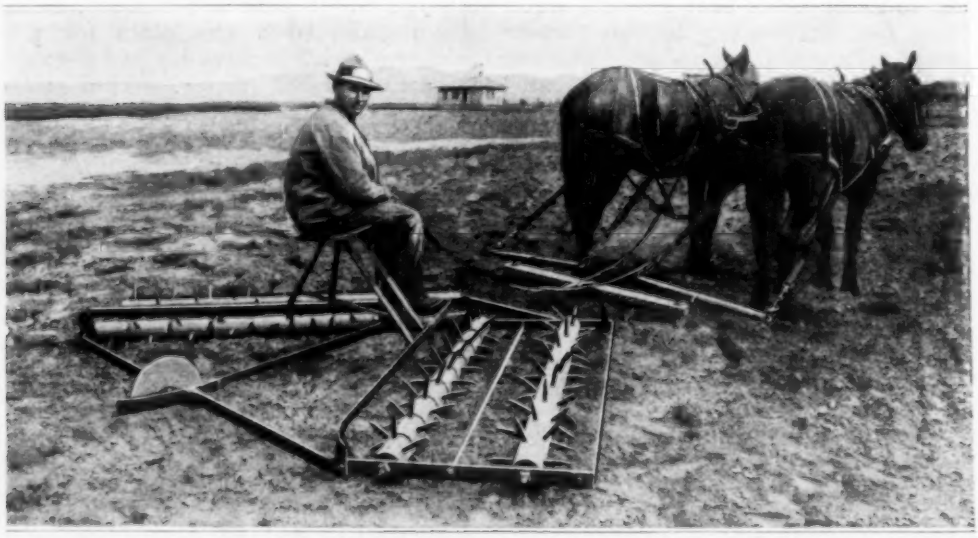
Rollers that bristle with steel spikes are a feature of a recently patented harrow, which is especially effective for pulverizing the soil and manure, and for breaking up any alfalfa there may be in the field being tilled. The harrow is V-shaped, the apex being at the front, and the sides being composed of two parallel rollers each. About 200 spikes are distributed spirally on these rollers, and as the implement is drawn across the field its rollers revolve, thoroughly breaking up the soil. A driver's seat is mounted above and just back of the front end, while midway between the rear ends is a steel disk, similar to those in a disk harrow, which serves to steady the implement. This harrow does away with the necessity of employing special means to pulverize the manure on fall and winter pasture fields.

NEW ARMY GUN MOUNTED ON RAILWAY CAR

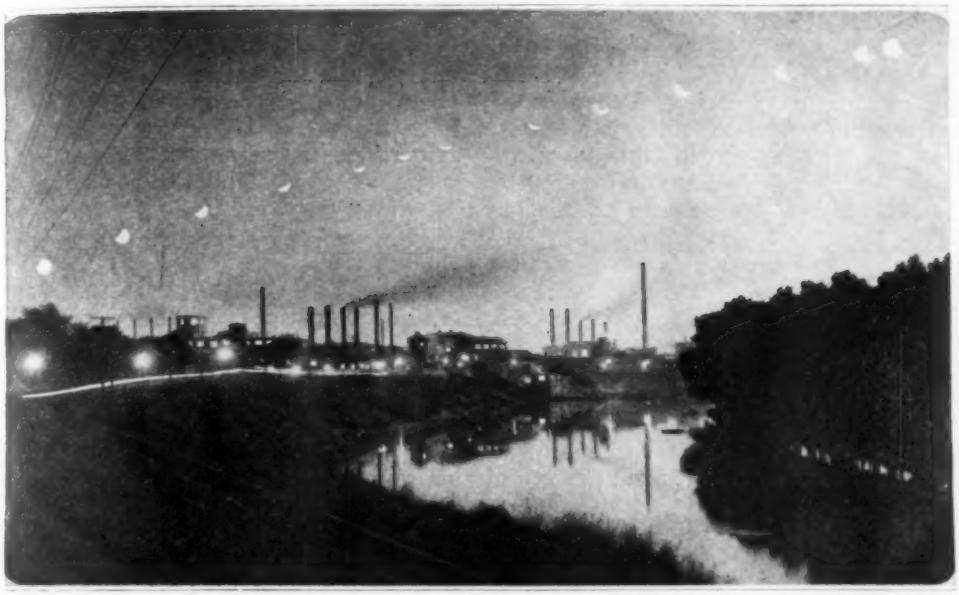
The ordnance department of the army is about to test a new 4.7-in. gun which has been designed to be mounted on a railway car. The gun carriage is so constructed that the piece will revolve on a platform. If the experiments prove successful it is anticipated that guns of this type will be made of larger calibers and that they will be employed to supplement our coast defenses. One place in which such guns would be of special value is the Canal Zone. By building spurs from the Panama Canal Railroad it will be possible to cover practically the entire zone with this easily transported means of defense.

NOVEL PHOTOGRAPH SHOWS PHASES OF ECLIPSE

The various steps in the progress of an eclipse of the moon are vividly illustrated in this novel photograph which was taken last July at Midland, Mich. The camera was placed in such a way that the moon would pass across the field of the instrument while it was partly eclipsed. Beginning at 9 p. m.



A New Harrow Having Rollers That Bristle with Spikes, Which Is Particularly Effective in Pulverizing the Soil and the Fertilizer as Well

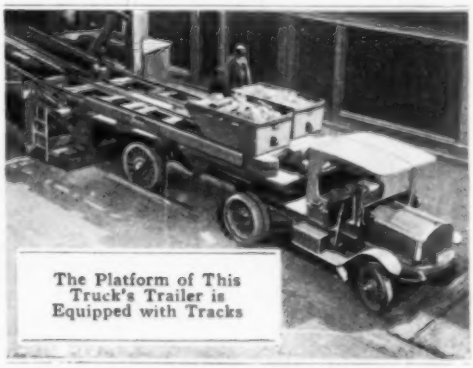


Unusual Night Photograph Showing Progress of Moon across the Sky and Also Various Phases of Its Eclipse. To Secure This Picture the Plate was Exposed One Second Every 15 Minutes for Three Hours without Moving the Camera

an exposure of one second was made every 15 minutes until midnight. The 13 partly eclipsed moons which appear in the picture are the result. These brief exposures were not sufficient to register the landscape on the film and so a 40-minute exposure was made with the camera still in the same position, at a time when the moon would not show in the photograph.

TRACKS ON TRUCK REDUCE LABOR IN HAULING STONE

An interesting example of the economy of labor which characterizes most large engineering undertakings is found in connection with subway construction in New York City. Here a 25-ton truck and trailer are employed, the latter having two parallel sections of narrow track mounted on its platform. These tracks are designed to receive buckets loaded with blasted stone, which are raised from the subway by derricks. Each bucket is equipped with flanged wheels, and when brought to the surface, is deposited on tracks and rolled by gravity onto the truck. The latter carries six buckets at a time to the water's edge, where their contents are dumped into barges. Each bucket, loaded, weighs about four tons. Wooden beams, bolted to the pavement, serve as guides in backing the truck into exactly the right position at the end of the loading platform.



The Platform of This Truck's Trailer is Equipped with Tracks

¶The Germans anticipate great business activity with the advent of peace, and in that connection there is talk of providing compartments on express trains, fitted up like offices, in which business men pressed for time can do some of their office work.

STATUETTE TYPIFIES PREPAREDNESS

A statuette typifying the spirit of preparedness now so widely advocated in this country has been produced by a Chicago sculptress, who has named it "Ready." It represents a manly athletic figure, clad in soldier's khaki, which stands alert, though not at rigid attention as do soldiers who are being inspected. In his right hand, which hangs at his side, he grasps a bugle; his left hand rests easily on his hip. The artist seems to have sought to depict a strong military figure without any suggestion of overbearing militarism.

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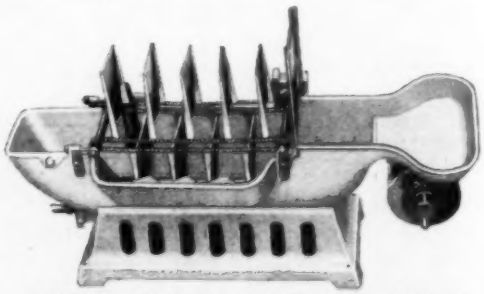
SUPER-ZEPPELINS BUILDING IN GERMANY

It has been the general belief that for some months Germany has been engaged in very materially strengthening her fleet of Zeppelins, but the details regarding her efforts have been guarded jealously. Recently, however, a former British official in a public address announced that a number of facts regarding the super-Zeppelins had been obtained. According to this authority two of these giant crafts had been completed at the time of his speech and four others were to be put into service later. These dirigibles are 780 ft. long, with an 80-ft. beam, and have a capacity of 2,000,000 cu. ft. Their maximum speed is 80 miles an hour, their cruising speed 35 miles an hour, and their radius of action 3,000 miles. The engines, of which there are six or seven, according to this report, have a total of 15,000 hp. Each airship carries a crew of 35 men and can carry five tons of bombs.

MOTOR-DRIVEN AUTOMATIC EGG BOILER

An automatic egg-boiling machine, now being introduced into hotels and restaurants, is so constructed that it will boil eggs exactly the number of minutes desired. The principal part of the device is a nickelplated tank, 32 in. long, which is filled with water and heated by steam or gas. A number of metal paddles, set vertically, move slowly through the tank from end to end, pushing ahead of them any eggs that may be deposited in the tank. These paddles are rigidly fastened to two endless chains that are placed above the sides of the reservoir and pass over sprockets driven by a 1/40-hp. motor. As a paddle passes over the sprockets at one end and begins to emerge from the water, it lifts the eggs in front of it onto the drainboard. The length of time an egg is cooked depends on the point at which its journey in the tank begins. The device is patented.

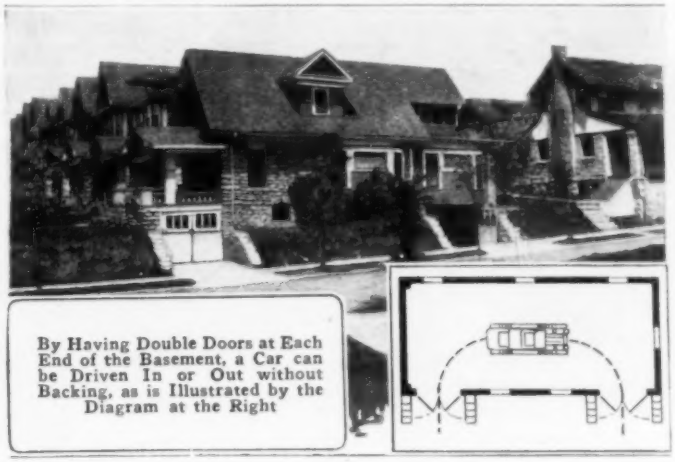


A Machine Which will Boil an Egg Precisely the Length of Time Desired and Then Deposit It on the Drainboard

¶A flying boat was tested recently, whose equipment included a wireless outfit, parts of which were contained in a helmet designed to overcome the noise of the motor.

PRIVATE BASEMENT GARAGE HAS TWO ENTRANCES

Real convenience is obtained with a double-entrance basement garage built by one car owner beneath his residence. The house is situated on a hill and the property, a corner lot, is terraced above the level of the adjoining sidewalk. Driveways leading from the pavement extend into the garage through large doorways provided at the front and rear on the street side of the dwelling. One of these extends beneath the front porch, so that the objection of having both openings in one supporting wall is obviated. The arrangement permits a car to be driven into the building at one end and out at the other, doing away with the inconvenience of backing.



By Having Double Doors at Each End of the Basement, a Car can be Driven In or Out without Backing, as is Illustrated by the Diagram at the Right

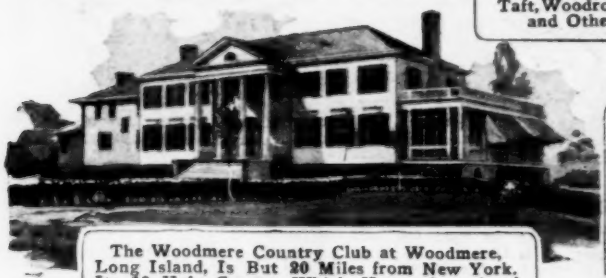
IRRIGATING PRESERVES ROADS IN ARID LAND

What is called road irrigating is the means now commonly employed in the Imperial Valley and other arid and extensively irrigated regions in southern California in making roads serviceable, which otherwise would soon become impassable because of the dust which accumulates on them to a depth of several inches. The method now employed is to make a ridge or levee along the center of the road and then flood one half of the thoroughfare with water, while traffic is confined to the other half. After sufficient water has been let in through sluice gates from the irrigating ditches, it is allowed to stand and gradually evaporate and seep into the ground, leaving a hard, smooth surface, over which one can travel in comfort. While the more recently opened half is being used, the other half is being irrigated in a similar manner. A much used section of road treated in this way will remain in good condition about a week.

Road Partly Flooded: Note the Ridge along the Center Which Separates the Portion being Used from That being Irrigated

AMERICA'S ATTRACTIVE COUNTRY CLUBHOUSES

Palatial Seat of the Chevy Chase Club at Chevy Chase, Maryland. William Howard Taft, Woodrow Wilson, Theodore Roosevelt, and Others Are Honorary Members



The Woodmere Country Club at Woodmere, Long Island, Is But 20 Miles from New York. Its 18-Hole Course, Which Has a Length of About 6,000 Yards and is Provided with Grass Greens, Is Quite Popular. Below is Shown the Water Hazard before the Ninth Hole

This Rocky Gully Forms a Splendid Natural Hazard on the Links of the Wanakah Club at Buffalo

A Splendid 18-Hole Golf Course That Keeps a Good Player on His Mettle Every Minute Is Adjacent to the Quarters of the Maryland Country Club, at Baltimore, Shown Here. Beautiful Grounds Shaded by Large Trees Make the Place Cool and Inviting during the Summer, When It Is the Scene of Many Gay Affairs

AND SOME OF ITS BEST-KNOWN GOLF COURSES

Home of Columbia Country Club, Chevy Chase, Maryland, Frequented by Congressmen

"Bunker Hill" Hazard on Park Links, Formed by Indian Mound of Exposition Days

The Inviting Quarters of the Park Club of Buffalo are Pictured Here. It is Conveniently Situated and Affords a Good Course

A Large Pit Beset with Conical Grass Mounds Guards the Sixth Hole on Baltimore Links

Residential Seat of Washington Country Club, at Jewell Station, Virginia, Where the President Frequently Takes a Turn at Golf

Situated on the Crest of a Knoll in Roland Park, Baltimore County, Maryland, Is the Hospitable Home of the Baltimore Country Club, One of the Show Places of the Community. The Club is Affiliated with the United States Golf Association and Supports One of the Best-Known Courses in That Vicinity

DUMB-WAITERS TO SERVE FOOD IN NOVEL CAFE

A restaurant in which there will be no waiters, and yet which will not be of the self-service type, has been designed by a Detroit café manager. The

A New Kind of Restaurant in Which the Food is Delivered, as Ordered, to Each Table by a Dumb-Waiter Extending from the Center of the Table's Top Down to the Kitchen Below

serving mechanism somewhat resembles that provided for an "electrical hotel" planned by a Paris electrician some years ago and described in Popular Mechanics Magazine at the time. Each table in the café, which it is proposed to open in Detroit, will be constructed with a dumb-waiter shaft extending from an opening in its top, through the base, and down to the kitchen below. A patron, on seating himself at one of these tables, checks off the food he desires on the bill of fare, and drops his order down the chute. When it is ready it is sent up to him on a three-tray dumb-waiter which, on rising in the shaft, elevates the centerpiece that covers the opening. With the food is the bill, which is paid to the cashier on passing out. Such an arrangement, it is claimed, will give the patrons more privacy without depriving them of personal service; it will require less help, will eliminate tipping, and will allow more room for dining tables because of the absence of waiters' tables. Dishes can be removed as well as delivered by the dumb-waiter, if so desired.

SOUNDPROOF APARTMENTS FOR MUSICIANS

Plans containing a provision for unusually effective soundproofing of walls have been drawn for an eight-story building to be erected in New York City, which will contain studios and living quarters for musicians and artists. This special provision will shut each apartment off from the others so that practice can be carried on by a musician without disturbing even his nearest neighbor. It is believed that the quietness which the apartments will possess will be regarded as an asset whether musicians are located near by or not. The floors and ceilings of the building will be made soundproof by furring down the ceilings and running a 1-in. felt insulation under all sleepers. The walls between the apartments on the same floor will be double, 3-in. gypsum blocks being the material that will be used. Between the two partitions will be a 2-in. dead-air space. Against the inside of one of these partitions felt will be placed extending from floor arch to floor arch.

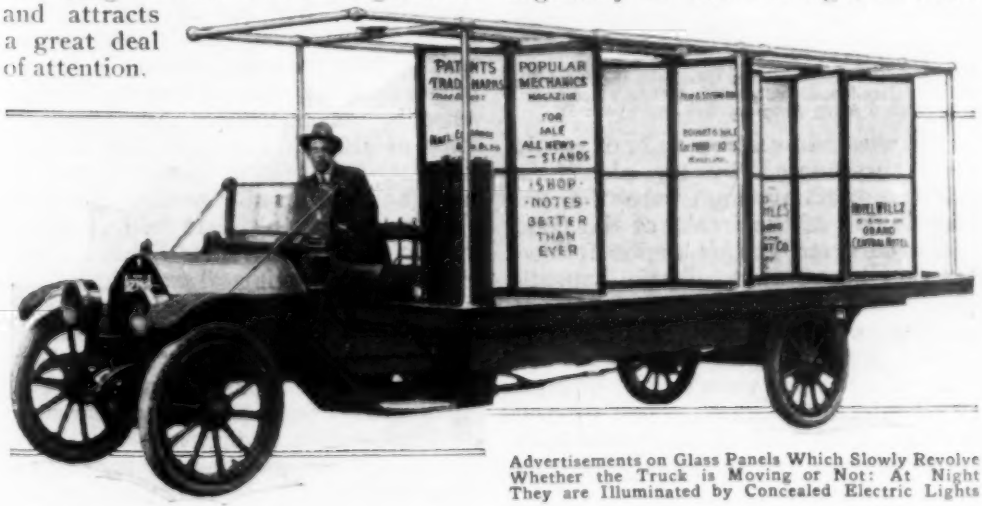
BIG RUSH TO NEW DIAMOND FIELD IN TRANSVAAL

Quite remarkable reports regarding the discovery of a new diamond field in the Transvaal have come from that country recently, and if they prove true, it will mean the opening up of a very rich diamond-bearing region. The field is about 18 miles from Pretoria and six miles from the famous Premier mine. According to a Pretoria publication a few diggings sold $1,500 worth of diamonds in three weeks, and one man found 31 of the

precious stones in two washings. It is stated further that only one wash has thus far proven entirely nonproductive. There has been a great rush of diggers to the region. One owner has divided up his section in plots, 15 by 20 ft., which he lets out to diggers at $10 per month. Recently, in one week, 40 claim licenses were issued. As yet no investigation has been made by the government's mining engineer and the undertaking today is purely speculative in character.

TRUCK CARRIES REVOLVING ILLUMINATED SIGNS

A motor truck on which are mounted revolving panels containing advertisements constitutes the novel means employed by the merchants of Wheeling, W. Va., to attract patronage. These panels are arranged in three groups, each of which slowly turns on a pivot and is supported at its upper end by a metal framework. Power for turning the advertisements is secured from the engine, which is so connected with the pivots that they can be revolved whether the car is moving or not. The panels, of which there are 48, are of opalescent glass, behind which electric lights are hung to illuminate the signs at night. The truck travels through Wheeling and the surrounding towns and attracts a great deal of attention.



Advertisements on Glass Panels Which Slowly Revolve Whether the Truck is Moving or Not: At Night They are Illuminated by Concealed Electric Lights

SINGLE-LENS CAMERA USED FOR STEREOSCOPIC WORK

Stereoscopic photographs may be made satisfactorily with an ordinary camera by employing a simple contrivance recently invented. This is a swinging base that is interposed between an instrument and its tripod and securely screwed to each. With it, a camera can be moved from one side to the other so that its lens assumes the angularity of both the right and left

This Device Permits a Camera to be Swung from One Side to Another so That Stereoscopic Pictures may be Made without Using a Special Instrument

eye. Two separate exposures must be made, the same shutter shot and timing being employed in each instance. In order to obtain correct angularity, the device has a gauge which, when set at a number corresponding to the distance in feet between the camera and subject, makes the proper adjustment. When viewed through a stereoscope the resulting prints show depth and solidity.

FLOOD LEAVES WELL HIGH ABOVE GROUND

Motorists and others on the Asheville-Charlotte highway in North Carolina have been astonished during

A Well on the Road between Charlotte and Asheville, North Carolina, Left Standing After a Flood had Washed Away Acres of Soil All about It

recent weeks to see the walls of an old well, surmounted by an old chain pump, projecting high into the air. This is one of the freaks of the flood which occurred in this region following very heavy rains. In the immediate vicinity of this pump, which stood in front of a store, soil to a depth of several feet was washed away from a tract of between six and eight acres. The well stands 16 ft. above ground and evidently was carefully built, for the stones rest one on the other just as they were laid in the well hole.

STUDY TO LESSEN DANGERS IN WATERS OFF PANAMA

A hydrographic station is to be established at Cape Mala, on the west side of the mouth of the Gulf of Panama. The waters off this point are much frequented by vessels from all parts of the world passing through the Panama Canal. Likewise at times this point is very dangerous. It is expected that as a result of the study that will be made at this station, vessels will be able to navigate around this point in greater safety. Recently the ship sent to renew the gas tanks at the Cape Mala light came very near foundering in a severe storm which sprang up without warning. Only by the most heroic effort on the part of the crew was the vessel kept afloat. The keeper of the lighthouse will have charge of the recording instruments and will make observations of the set of the currents, as is the practice at lighthouses in the United States. The instruments used will include an anemometer to measure the velocity of the wind, an anemoscope to indicate its direction, a tide gauge, and a standard rain gauge.

WILL IMPROVE HUDSON'S AIDS TO NAVIGATION

Instructions have been issued by the Lighthouse Service of the United States Department of Commerce requiring that work on various improvements on the Hudson River shall begin as soon as possible. An appropriation of $100,000 for improving aids to navigation and establishing new aids was included in the sundry civil act approved last July. It will be used in establishing four new lights on the river and improving 20 existing lights. The Hudson's increasing freight and passenger traffic calls for a modern system of flashing lights, supported by concrete foundations. Many of the existing aids to navigation are so constructed that it is impossible to keep them in operation when the ice begins to move.

NEW PROCESS FREEZES ICE BLOCKS IN A FEW HOURS

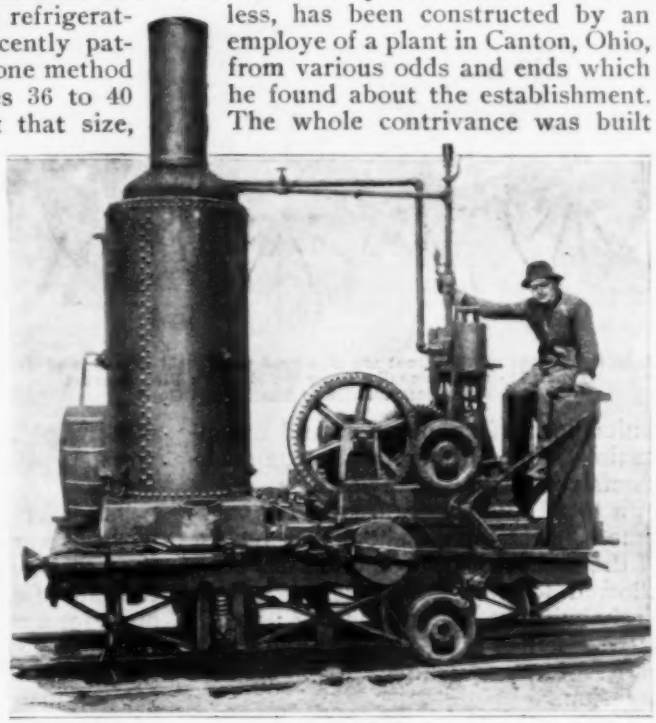
That he can artificially freeze a cake of ice 12 in. thick in an hour or two is the claim of a Louisiana refrigerating engineer, who has recently patented his process. Under one method prevalent today it requires 36 to 40 hours to produce a block that size, and under another, seven days. By the new process the water, which preferably is precooled, flows in a thin sheet down a plane that is cooled on the opposite side by circulating brine. However, the refrigerant, which is air or a gas, acts directly on the surface of the water. As the water keeps on flowing and the temperature of the refrigerant is maintained, a block of ice is steadily built up. The freezing takes place rapidly because the gas or air is in direct contact with the water and does not have to penetrate through ice that has already formed. If the flow of water is made a little greater than the capacity of the refrigerant, the surplus will carry off impurities that might otherwise be frozen in the ice.

ITALY USES MANY MOTOR TRUCKS IN WAR

In preparing for their advance against Gorizia, the Italians are said to have used no less than 82,000 motor trucks. These carried 500,000 men, 85,000 animals, 15,000 vehicles, and enormous quantities of material to the front. Another extraordinary record was made by 1,000 motors, which transported 100,000 men, covering 125 miles a day for a considerable period. Thus motors were an immense factor in the victory which the Italians won.

LOCOMOTIVE MADE FROM ODDS AND ENDS

A strange-appearing locomotive, but one that is very serviceable nevertheless, has been constructed by an employe of a plant in Canton, Ohio, from various odds and ends which he found about the establishment. The whole contrivance was built without purchasing a part. A boiler and an old engine were mounted on a small flat car and properly connected. One of the axles of the car was extended and a pulley rigidly fastened to it. An endless steel cable transmits power to two car wheels through this pulley from a similar pulley mounted on the engine. The cable is wound around each pulley two or three times to increase its friction, and is held taut by means of two other pulleys which draw it to either side. One of these auxiliary pulleys is held in place by a long coil spring. The other has been drawn into position by a turnbuckle, evidently once used on much heavier work. The locomotive is employed to haul dump cars loaded with dirt, and does it as satisfactorily as an ordinary engine would.

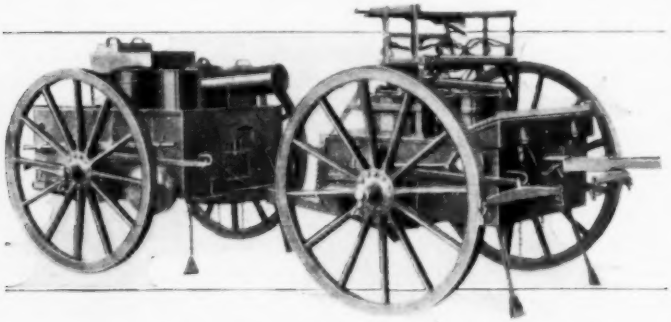


A "Homemade" Locomotive Made Entirely of Parts Found about a Plant in Canton, Ohio, Many of Which had been Discarded

CANADIAN EFFICIENCY MEETS WAR PROBLEMS

By FRANCIS J. DICKIE

CANADA'S performance since the outset of the European war furnishes an excellent illustration of the fruits born of coöperation and organization. But although its accomplishments constitute a noteworthy example of a totally unprepared country's wartime efficiency, sight should not be lost of the fact that the Dominion has been allowed to marshal its resources entirely without interference. Although at war, it has not been in the position of a country defending itself against invasion.



Canadian Troops at the Front are Equipped with Field Kitchens of This Type: They Occasionally Draw the Enemy's Fire Because of Their Resemblance to Small Field Guns

During the two years following the opening of hostilities abroad, Canada raised an army of 340,250 men. This number was recruited from among the 1,250,000 subjects, eligible for service, out of a total population of about 8,075,000. It fitted these men with the most modern equipment and established six large training camps in Ontario, Manitoba, Alberta, British Columbia, and Quebec, where volunteers have been and are being rounded into shape. In July of this year the various provinces had sent 190,000 troops to the aid of the allies and were drilling the remainder of its forces.

The Canadian soldier receives the highest wages of any engaged in the present conflict. Privates are paid at the rate of $1.10 a day, while the maximum for a commanding officer amounts to $25 a day. Thirty-three thousand casualties have occurred among the 190,000 men sent overseas, in addition to a large number of maimed and per-

Sons of Canada, 10,000 Strong, Marching through a Small Town. So Far 190,000 Well-Equipped Men have been Sent Abroad for Service

Big Training Camps have been Established in Various Provinces. During July More than 30,000 Men were Concentrated and in Training at Camp Borden in Ontario

manently disabled fighters who have been returned.

A private who is completely disabled receives a pension of $480 a year from the government and from 60 to 80 per cent of this amount if only partly incapacitated. A captain, on the other hand, receives $1,000 per annum, and a colonel $1,890, if helplessly crippled. In the event of death, a widow receives 80 per cent of the pension throughout her life unless she remarries, while for each minor child she is allowed from $6 to $10, according to the official rank of the deceased father. Furthermore, while a soldier is away from home fighting, the government contributes, in case of necessity, a small sum for the support of those dependent upon him. The wife of a private, for instance, receives $20 a month and $5 for the support of each child. The scale increases proportionately for the wives and children of officers. In addition to this, there is a private fund, raised by popular subscription, from which similar sums can be obtained by the needy family of a soldier. At the time of writing, Canada has raised $400,000,000 for carrying on the war and is understood to be on the verge of voting additional funds. The country has contributed liberally to relief funds; up to last April had supplied 48,000 horses for its own and England's cavalry and artillery, and has sent nearly 10,000 physicians, surgeons, and nurses to the front.

Before Canada's Recruits Smell Powder in Europe They are Given a Thorough Workout at Home. Here a Trench is being Constructed in Frozen Clay

Between August, 1914, and July of this year, 422 munition factories were

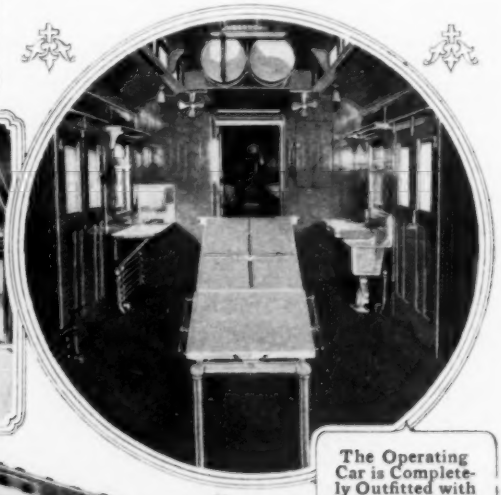
established. During the same period war orders aggregating approximately $500,000,000 were accepted and half of them filled. The remainder are now being turned out at the rate of $30,000,000 a month.

Despite the great financial drain that war always brings, bank deposits in the Dominion have increased 10 per cent. During the last fiscal year nearly 5,000 miles of railway lines were constructed, while to two transcontinental roads the government gave in cash subsidies and aid a total of almost $28,000,000. Business failures were fewer during the last fiscal year than in the previous one, and commercial conditions in general improved.

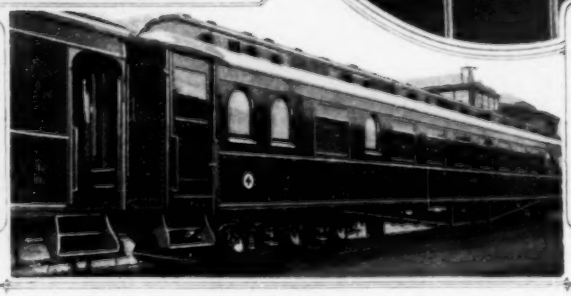
NEW ARMY HOSPITAL TRAIN IS SENT TO THE BORDER

Within the last few weeks a thoroughly outfitted military hospital train has been completed at Chicago and dispatched under the command of army officers to the Mexican border. As was told in another issue of this magazine at the time the work was under way, the train consists of 10 cars especially arranged in accordance with plans prepared by the army medical department. In one very striking respect the ward cars differ from those in common use abroad. Instead of being equipped with triple tiers of stretchers, each is supplied with iron beds placed end to end in a single row on either side of the aisle. Disappearing berths, like the uppers in a Pullman car, are provided so that additional capacity can be had in case of need. Six of the carriers are of this type. The others consist of an operating car, a combination baggage and library car, a kitchen car, with facilities for attending to the wants of 200 patients and their attendants, and a standard Pullman. Electric fans, built-in medicine chests, and large ice tanks are provided.

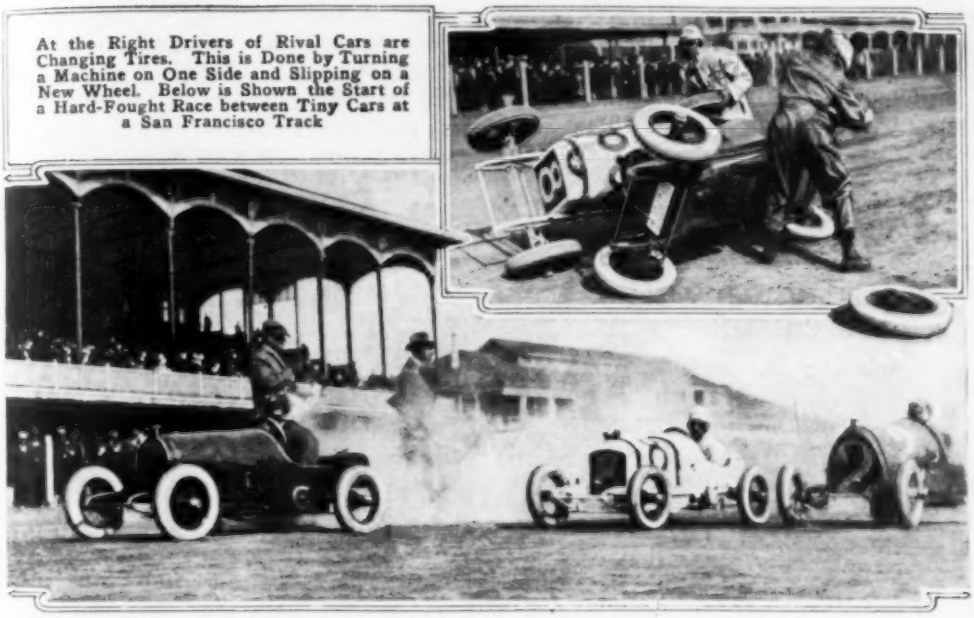
¶A composing stone has been made of concrete for a Texas printer which is said to be superior in some respects to the familiar marble slab. It is 5 ft. square, 4 in. thick, and its surface was troweled to a glass finish.



Each of the Six Ward Cars is Fitted with 18 Single-Width Iron Beds and a Similar Number of Upper Berths. Slightly Wounded Soldiers Who Are Able to Sit Up will be Cared For in Pullmans



The Operating Car is Completely Outfitted with Modern Surgical and Sanitation Appliances and Accessories. As Shown at the Left, the Exterior of the Cars Bears the Red Cross Insignia



At the Right Drivers of Rival Cars are Changing Tires. This is Done by Turning a Machine on One Side and Slipping on a New Wheel. Below is Shown the Start of a Hard-Fought Race between Tiny Cars at a San Francisco Track

BABY-MOTOR RACES ATTRACT CROWDS ON COAST

Baby-motor-car racing is rapidly evolving into quite a novel and fascinating sport for those who enjoy automobile events. It has been indulged in at tracks in California for a couple of years, beginning with contests between boys driving homemade machines powered with motorcycle engines. The accompanying pictures, snapped on the Tanforan race track at San Francisco, show to what extent the sport has grown. The miniature cars are undeveloped in size only. In other respects they are up-to-the-minute racers, stanch, speedy, and trim, with strong engines that hum in a businesslike, powerful, satisfying way. In fact they are perfect models of some of the best-known racing cars and capable of rumbling over a track at the rate of 70 miles, or more, an hour. At Tanforan the event has been greeted by enthusiastic crowds and it is announced that eastern speedways will be visited during the fall by the teams driving these mouselike little cars, which are tilted about amusingly when tires are changed.

SHRAPNEL SHELL MADE INTO TABLE LAMP

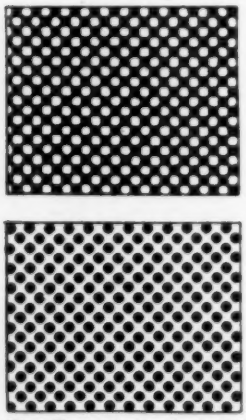
A novel lamp, suggestive of warfare, has been constructed for a Russian inspector of munitions temporarily residing in this country. A nickeled shrapnel shell serves as the upright portion of the lamp's standard. Fitted into the nose of the shell is a

A Nickeled Shrapnel Shell Serves as the Upright for This Artistic Table Lamp

hollow steel tube, at the upper end of which two electric-light sockets and bulbs are attached. These lights slant downward at an angle and are covered by a fringed silk shade. The shell stands in a polished base turned from hard wood. The electric cord enters the base and passes upward through the shell to the sockets.

ENAMEL CHIPS FROM COLOR PLATE, CAUSING TROUBLE

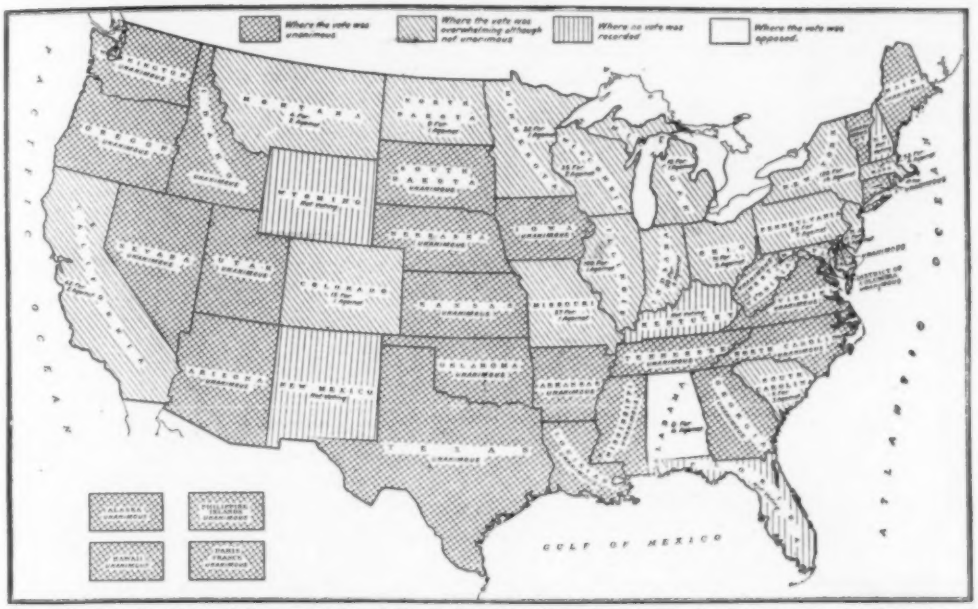
In printing the cover of a Chicago magazine recently, a rather unusual and confusing condition presented itself. The flat proofs made from the color plates came out as they should, but a botch resulted when the run was started on a cylinder press. Instead of being like the proofs, the cover was lifeless and showed a loss of about one-half the color value. The half-tones measured up properly, and printers and pressmen at the largest plant in the city were unable to offer any explanation for the condition, or to correct it. Microscopic examination of one of the plates, however, subsequently disclosed that the film of baked enamel covering the copper had been cracked off the corners of the square dots comprising the screen. Instead of happening only here and there, it had occurred with remarkable regularity over the entire surface, practically every dot being affected. On the cylinder press, which uses no padding as does a hand press on which proofs are struck, only the small round dots, formed by the remaining specks of enamel, printed. Since these presented only about half the surface area of the square dots, the loss in color value was proportionate. Too strong hydrochloric acid may have been used in the etching process, or a too heavy solution of bicarbonate of soda employed in cleaning the plates. The top section of the accompanying illustration indicates how the screen should have printed, while the lower part shows the impression actually made. The dots are greatly magnified. The trouble was obviated by removing the remainder of the enamel.



The Enamel Cracked Off the Corners of the Square Dots, Causing the Color Plate to Print as Shown Below, Instead of as at the Top

FILE FOR FORM LETTERS SIMPLIFIES DICTATION

In view of the fact that a large percentage of the correspondence in many business offices consists in dictating letters which in part, at least, are identical with many other letters sent out daily, a maker of office devices has designed a compact, handy file in which such repeatedly used letters and paragraphs can be assembled, after having been expressed in the best possible English. The file consists of a metal base, the rear end of which is higher than the front, and a slanting support at the back to hold patented hinged cards, measuring 6½ by 7 in., which normally stand on edge. To these the forms are pasted. Each card has an index number on its upper edge and at the front of the file are reference guides referring to these numbers. Instead of dictating a form letter, one can simply hand the correspondence to the stenographer marked with the number, or numbers, that indicate the letter, or paragraphs, one desires used in the reply. Carbon copies may be dispensed with if the notations on the correspondence are preserved, and in this way one's whole system of letter filing can be simplified.


Where the vote was unanimous
Where the vote was overwhelming although not unanimous
Where no vote was recorded
Where the vote was opposed
GULF OF MEXICO

Map Showing the Vote of Commercial and Trade Organizations throughout the Country on the Question of Universal Military Training. The Various Bodies Participating were Entitled to from One to Ten Votes, According to their Membership

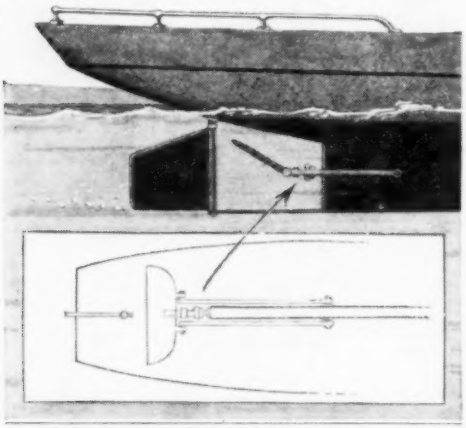
COMMERCIAL BODIES VOTE FOR MILITARY TRAINING

The almost unanimous sentiment in favor of universal military training, which has developed within the past few months in business and commercial circles, is strikingly illustrated in a referendum vote that was taken recently by the Chamber of Commerce of the United States. In this test of public opinion commercial and trade organizations in all but five states in the union participated. The proposition submitted to them was as follows: "The committee, recognizing military obligation equally with civic obligations as a fundamental duty of democratic citizenship in a republic, and to establish a system which will affect every man alike—recommends that universal military training be adopted as a fundamental democratic principle of our military policy and be enforced by law to furnish adequate land, sea, and industrial forces in peace and war." The ballot showed 889 votes in favor of this recommendation and 56 votes against it. In 24 states the vote was unanimously in the affirmative. In only one state was it unanimously in the negative. In all those commonwealths where there was a divided sentiment, the great majority were for universal military training.

PROPELLER THAT OPERATES LIKE A FISH'S TAIL

A recently invented propeller, which can be fitted to any water craft with little alteration, resembles in its motions the thrusts of a fish's tail or of an oar used in sculling. Quite surprising speed can be obtained with the new invention. The propeller proper, which may be fastened either vertically or horizontally at the rear of a boat, is a long straight blade. It is held in place by two thrust rods which are fastened in a hinged manner to its forward edge and are, in turn, fastened to the boat's skeg in the same way. The blade executes an oscillating motion, and if, for example, it is fastened to the boat horizontally, at the beginning of its downward stroke it will lie parallel with the propeller shaft. As the stroke progresses the front edge of the blade

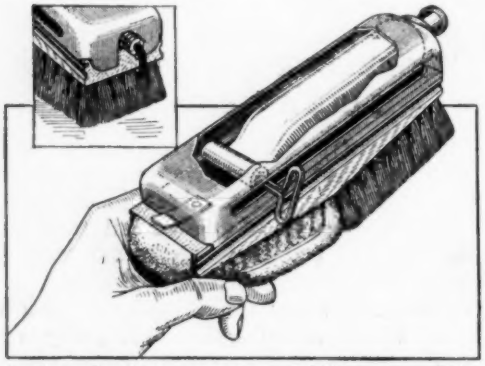
assumes a lower position than the rear edge. The greatest angle is assumed at the completion of half of the stroke. By the time the lowest position is reached the two edges are again on a level. On the upward stroke the relative position is reversed, the forward edge being higher than the rear edge. Thus in each stroke the boat is given a forward thrust. Little power is lost because the thrust is imparted directly to the rods instead of being dissipated on bearings. The movement described above is obtained by the revolving of the propeller shaft, which is of special design. An arm projects from the end of the shaft at right angles and from this arm there extends an angularly offset pin which engages a slot in the forward edge of the blade. As this revolves it produces the downward and upward strokes in the manner already indicated.



A Propeller Blade Which Oscillates Like a Fish's Tail and Enables a Boat to Acquire Quite Remarkable Speed

COMBINATION SHOE BRUSH AND POLISH CONTAINER

A shoe brush and shoe-polish container, recently patented, is so designed that it combines in one convenient unit several articles used in shining shoes. Both a fine and a coarse polisher are supplied in the brush, one-half of its face being covered with sheep's wool and the other half with bristles. Grooves in the sides of the wooden back of the brush permit a rounded metal cover to be slidably fastened to the brush, and in this cover a collapsible tube of shoe paste is kept. The cap on the tube extends through the end of the cover and can be removed as paste is needed. The handle of the key which is used to wind up the tube and expel the paste extends through a slot in the side of the cover. After sufficient paste has been expelled and applied directly to the shoes, the cap can be replaced and the shoes polished without soiling the hands.



A Shoe Brush in the Back of Which Is a Tube Containing Paste That can be Applied Directly to the Shoes without Soiling the Hands

TOWING SIGNALS EMPLOYED AT PANAMA LOCKS

When ships pass through the locks of the Panama Canal they are in charge of a pilot who, by means of signals, controls the big electric towing engines. At the outset modified railway signals were used for lack of standardized signs. It soon became apparent, however, that special signals of a precise nature must be devised, and directions were therefore given to several men especially intimate with the work to develop a definite code. This was done, but more recently, as a result of the experience gained through further handling of traffic, a revision of the signals has been made. They are now given in two parts, preparatory and executory.

Fig. 1, Coiling: Motion of Hands at Top Indicates Direction, In or Out, with Respect to Locomotive

Fig. 2, This Signal is Used to Cause an Engine to Move Forward, Accelerating Tow

Fig. 3, Emergency: Forward Locomotives Keep Windlass Clutch Engaged While Ascending Approach

In addition to those reproduced herewith, bell and whistle signals are employed. Two taps of a bell, for instance, indicate that a driver has received and understands a signal. Three taps are used to attract attention or cause a signal to be repeated. Continuous ringing constitutes the alarm signal. When the pilot, on the other hand, wishes to attract attention he extends his arms overhead and oscillates them until a response is given. When all lines are to be cast off, a single blast of the ship's whistle is blown. To change the position of an engine, the pilot extends both hands toward it preparatorily. Then to cause the execution of the order he swings one arm toward the place the locomotive is to go. When several short blasts of the ship's whistle are blown, it means that all locomotives must pull full astern. The numbers in the diagrams indicate the order in which the motions are made.

Fig. 4, Locomotives Stop Pulling, Allowing Tow to Coast, When This Sign is Given

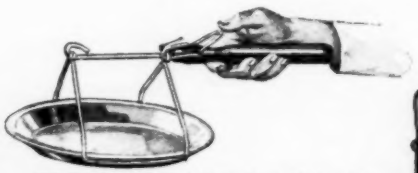
Fig. 5, This Position Is a Successive One to That Shown in the Middle and Means to Stop the Tow

Fig. 7, "Enough," "All Right." Succeeds the Signal Illustrated at the Right

Fig. 6, Easing or Releasing the Brakes. Marked Emphasis on Upward Stroke Indicates Latter Order

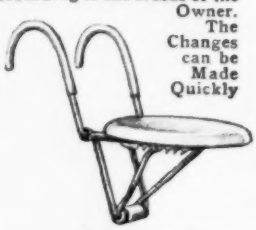
SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

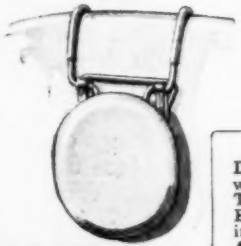
Here Is a Convenient Article for Use When Trading. It Is Capable of being Converted into Three Different Sizes so as to Serve as a Pocketbook, Hand Bag, or Shopping Bag According to the Needs of the Owner. The Changes can be Made Quickly



With This Wire Lifter, Hot Plates, Pie Pans, and Similar Things can be Removed from an Oven or Stove without Burning One's Fingers

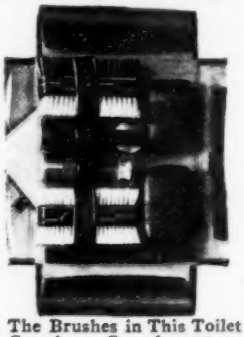
Loops Fitted to the Leather Case Permit This Flash Light to be Worn on a Sportsman's Belt. It Gives Either a Flash or Continuous Light





The Folding Bath Seat Shown Above may be Adjusted to Whatever Angle the User Desires. When Not Employed It Occupies a Minimum of Space

Goggles for Night Driving Having Lenses with Opaque Diagonals That Shade Pupils of Eyes When Encountering Blinding Lights of Approaching Motors. Spots Are Not in Line of Vision and Head is Turned Slightly to Right to Cast Shadow



The Brushes in This Toilet Case have Complementary Backs That Fit Together, Obviating the Poor Practice of Meshing the Bristles

Glass-Lined Silver Tray, with Service Knife and Fork, for Biscuits, Butter, and Cheese. It might Also be Used for Nuts or Mints

Springy, Light Steel Bands That Encircle the Heels of One's Shoes, Preventing Them from Wearing Unevenly and Becoming Slouchy

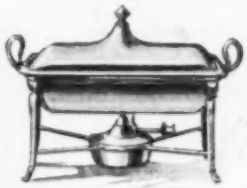
Combination Cooking Stove and Heater: The Oven Space Is of Liberal Size and Need Not be Opened in Order to Gain Access to the Cooking Surface

In the Bottom Compartment of This Kitchen Cabinet a Sliding Tray is Provided to Facilitate Access to Pots and Pans at the Back

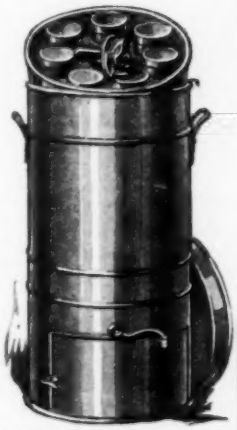
When Shelf Space is Limited, These Metal Hooks may be Resorted to and All of One's Pans Hung against a Wall Out of the Way

Grapefruit Set Consisting of a Corer and Perforated Nickel-Silver Tray That Fits into a China Saucer Which Catches the Waste Juice

Medicine Bottle and Dropper Combined: At the Top Is a Rubber Bulb, While a Cap Encloses the Dropper End When It Is Not in Use, Keeping It in a Sanitary Condition

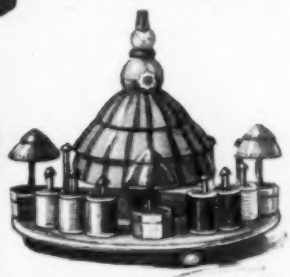


An Artistic Hash Dish Provided with a Water Pan to Keep the Contents Hot without Allowing Moisture to Evaporate. An Alcohol Lamp is Used



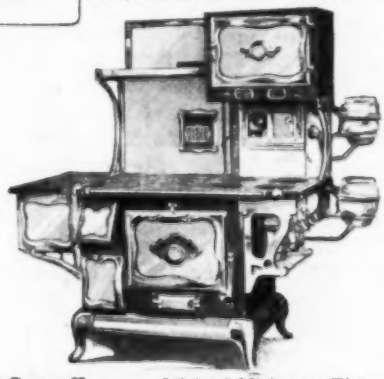
This Metal Flour Bin and Sifter Has a Roomy Compartment in the Top Supplied with Boxes for Nutmeg, Cloves, Cinnamon, Mace, and Other Spices

Winter Motorists Find Comfort in This Lap Robe with Large Muff Pocket: The Straps Clamp to the Edge and Hold the Robe in Place about the Body. It can be Rolled and Fastened, Forming Its Own Case, as Shown at the Right



Novel Sewing Set Pleasingly Decorated: The Doll's Skirt Covers a Box Intended for Pins and Scissors, While Its Hat Is a Thimble

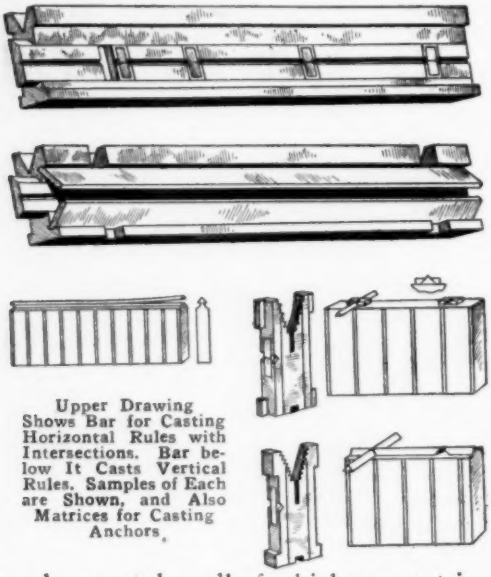
Convenient Power-Driven Washer and Wringer: The Lid, Mounting Agitator, is Built so That It may be Fitted over an Ordinary Tub and Used While Clothes in Other Container are being Wrung



This Range Burns Kerosene Oil in Addition to Either Wood or Coal. The Combination Makes Possible a Cool Kitchen in Summer and a Warm One in Winter

NEW LINOTYPE ACCESSORY SETS ALL TABULAR WORK

An equipment for linotype machines has been patented which produces complete tabular forms, including vertical

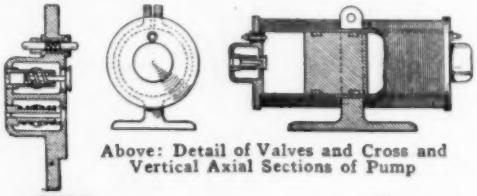


Upper Drawing Shows Bar for Casting Horizontal Rules with Intersections. Bar below It Casts Vertical Rules. Samples of Each are Shown, and Also Matrices for Casting Anchors.

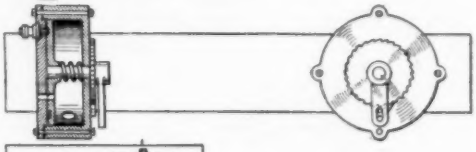
and cross rules, all of which are cast in the ordinary manner on slugs, and along with printed matter if desired. The invention has many advantages, including a saving of the cost of brass rule and the time employed in the latter's distribution, the entire form being cast into the pot when no longer needed. A special bar is inserted into the elevator head of the linotype machine for setting up horizontal rules of any length up to 30 ems; for a job where intersecting rules are used, special patented devices are set in the side of the bar which cast triangular holes in the edge of the rule, through which slender triangular rules without bases are inserted when the form is on the stone. These also are made with a bar set in the elevator head; in its side are set longitudinally two hinged leaves, so positioned and shaped that they form along the top of the slug a triangular strip having a very slender base from which it is detached before being used. The leaves on the side of the bar, being hinged, readily release the slug despite the grooves they make in forming the edge. When it is desired to set type and intersecting or vertical rules in one job, special matrices of the ordinary size are employed, the edges of which are supplied with patent devices which cast either triangular holes in the horizontal rules or anchors in other slugs. With this equipment an entire tabular form can be set by the operator, after which the vertical triangular strips are inserted when the form is on the stone.

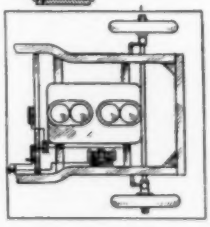
ONE-CYLINDER MAGNETIC PUMP HAS MANY USES

A simple magnetic pump has been patented which requires electrical connection with but two wires and is adaptable to many uses. It has been employed as an automobile starter driven by a six-volt storage battery and pumping from the carburetor into the cylinders; it obtained a high rate of efficiency, and used 23 amperes. It may also be used as a mine pump to advantage. Pumping operations are



Above: Detail of Valves and Cross and Vertical Axial Sections of Pump





Vertical Axial Section and End View of Distributor are Shown Side by Side Above. Position of Pump beside Automobile Engine Shown at Left

performed by one piston and cylinder, the latter having an intake and outlet at each end. The piston is actuated by two solenoids, likewise one at each end, and connected in multiple with an elec-

tric circuit. The proper electric connections for operating the piston are secured through the energizing of two auxiliary solenoids, also connected in multiple, in which a core oscillates, thereby shifting a switch bar which governs the flow of current through the principal solenoids. The liquid is pumped through two pipes that lead from the cylinder to a distributing chamber. The oscillating core in the smaller solenoids serves to slowly revolve a distributing valve in this chamber by which gasoline, for example, may be discharged successively into the cylinders of a gasoline engine, while another attachment properly times the latter's ignition.

BASE FOR FLYING BOATS PROPOSED FOR NEW YORK

Eventually some New York business men, lawyers, and others, will be carried in flying boats to and from their offices daily, if the campaign now being conducted in New York is successful. Members of the Harlem Board of Commerce, as well as other business men who are deeply interested in aviation both as a sport and because of its vital relation to national defense, are seeking to enlist the aid of the government in establishing a station for flying boats at 129th Street and North River. Here machines could be left by men who would fly to their offices, and here, also, military and civilian airmen could be trained. A station of this character, if constructed, will mark a new step in the progress of aviation in this country.

SHADES FURNISH WINDOW VISTAS FOR PORTRAITS

Photographers have recognized for some time the fact that very artistic effects can be produced by using as a background for a portrait a window beyond which there is a pleasing vista. For amateurs, particularly those living in a city, such a background is very difficult to obtain. Now, however, any photographer can take portraits with attractive window settings by using two window shades, recently patented. They are both of translucent material.

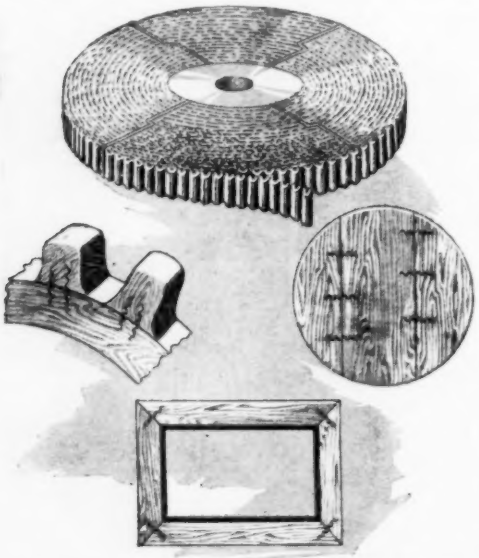
Shades That Furnish an Artistic Window Vista for Use as a Portrait Background: Front Shade is Partly Cut Away, Revealing Second Shade More Clearly

One curtain has printed upon it a representation of an artistic window casement, and the second, of which many designs are obtainable, is decorated with a pleasing landscape scene and is hung immediately behind the first curtain. In a photograph the background produced with these curtains is very realistic.

CORRUGATED FASTENERS MADE FOR MANY USES

An increased number of uses for corrugated fasteners is resulting from the fact that these substitutes for nails and staples are now being made in a considerable variety of styles. They are used extensively in various kinds of cabinetmaking, in joining the corners of picture frames, in making patterns of wood, in constructing heads of barrels, etc. A particularly useful form of these fasteners is made with one edge sharpened and so cut as to have teeth. These do not tear or

split the wood as much as the smooth-edged fasteners do. Another style of fastener is made with diverging corrugations, those at one end slanting



Three Examples of How Corrugated Fasteners can be Used in Place of Nails, Staples, and Glue. The Coil of Corrugated Material is Designed to be Inserted in a Machine Which Cuts and Drives Fasteners as Needed

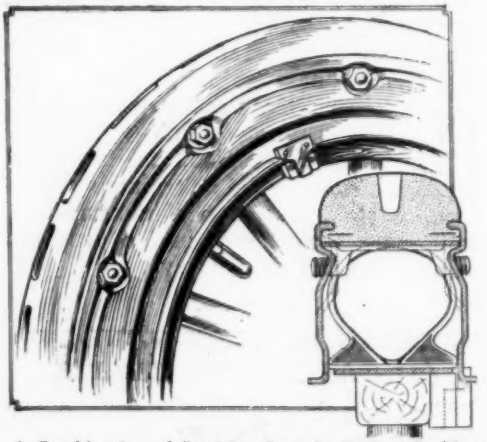
slightly in one direction and those at the other end diverging a little in the other direction, while the center corrugation is narrow at the top and wide at the bottom. This form serves to draw joints very close together as the metal strip is driven into the wood. This patented corrugated material can also be secured in large coils adapted for use in a machine which cuts and drives the fasteners as needed.

UNIQUE BANK CHECK THREE FEET LONG

What is probably the largest bank check on record, from the standpoint of linear measurement, is being designed by an artist in Warren, Pa., for the chamber of commerce of that city. It is to be used in a novel way. The check measures about 3 ft. long and 18 in. wide. It will be made out for the sum of one dollar by the chamber of commerce and in favor of the mayor of Warren. The plan is for the mayor to indorse the check and use it to pay some obligation. Then the person receiving it is to indorse it and pass it on in the same manner. In this way it is proposed to circulate the check throughout the city until there remains no more room for indorsements, whereupon it will be cashed by a bank and a record made of its journeyings. It is not intended to circulate the certificate outside of the city of Warren. It is being issued with a view to emphasizing the desirability of transacting business in one's home town.

PUNCTURE-PROOF TIRE HAS STEEL CASING

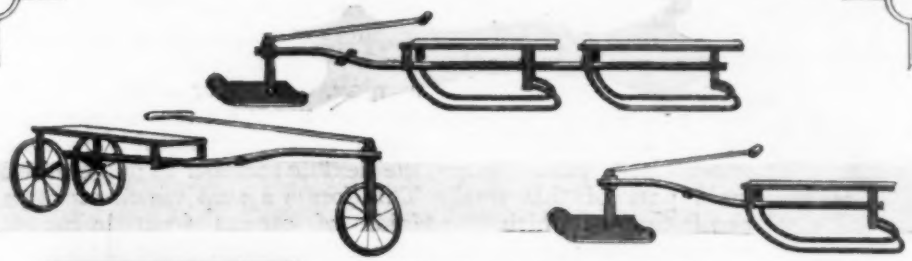
A resilient wheel, in which a pneumatic tube is combined with a steel casing and an outer hard-rubber tire, has been patented. The inner tube rests on a steel band that encircles the felly. Three steel bands inclose the tube, one at either side and one corresponding to an outer rim. The side bands are fastened to each other by bolts, so flattened as not to interfere with the tube. The third steel band is itself inclosed with a hard-rubber cushion which engages the side steel bands by means of flanges on the lat-



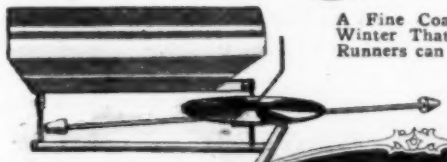
A Combination of Steel Bands and a Rubber Cushion, Protecting a Pneumatic Tube, Constitute the Chief Features of This Puncture-Proof Tire and Resilient Wheel

ter. The side bands are so fastened to the wheel as not to interfere with the resiliency afforded by the pneumatic tire.

THE CHILDREN'S PAGE OF NEW IDEAS



A Fine Coaster for Summer and Winter That Steers Easily. The Runners can be Slipped On Quickly



New Kind of Phonograph for Outdoors or Playroom: Folds into Small Space and Uses Regular Needles and Records

A Wide, Comfortable Pad That Keeps Skate Strap from Hurting the Ankle Is a New Accessory for Skaters

Magic Metal Slate: Draw Any Design by Passing a Magnet over It. To Erase, Just Turn Upside Down

It Is Fun to Clean Blackboard Erasers Where Schools are Equipped with This Vacuum Cleaner Made Especially for This Purpose. All the Dust is Sucked into the Machine

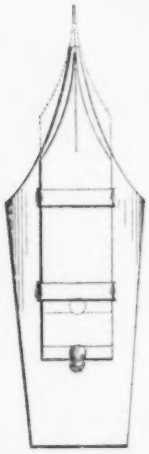
A Toy Gun That "Disappears" and Revolves on Its Turret Like the Big Guns on the Coast

Hand-Painted Ark on Wheels, 27 Inches Long and Strong Enough to Hold Lots of Toys

Candles for Birthday Cakes: By Pulling at Each Wick a Verse is Drawn from within the Candle

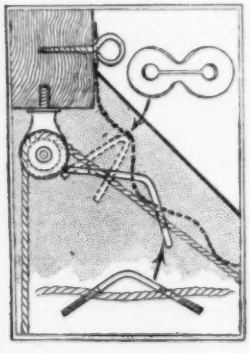
PEN WITH DOUBLE NIB HAS FINE AND STUB POINTS

The double-pointed pen is an adaptable writing implement which has been patented. It serves both as a stub pen and a fine-pointed pen. The main part of this dual pen is the one which fits into the holder and has a stubbed point; in general appearance it resembles an ordinary pen except that across the back are two raised bands beneath which a narrow strip of metal, having a fine pen point at one end, is inserted. By pushing a knob on the upper end of the supplementary nib, the finer point can be made to extend down beyond the stub or it can be instantly withdrawn so that the coarser point is available for use. The invention has interesting possibilities for a person who does heavy and light ruling, and for use at a public writing desk where a variety of pens is ordinarily desirable.



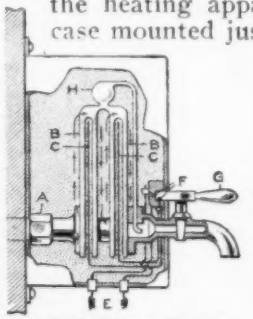
AWNING ACTION IMPROVED BY NEW ATTACHMENT

In an attempt to provide a means of preventing the canvas from jamming and interfering with the operation of the sheaves when an awning is being raised, a small device has been invented and patented which, if attached to a rope, keeps the folds of cloth from coming into contact with a pulley. This consists of a small piece of leather or rubber with a longitudinal slot, at each end of which is a hole of suitable size to permit the passage of a rope. When it is applied near a sheave it normally lies in a flattened position, gripping the rope firmly. When the latter is pulled upon in order to raise the awning, the upper end of the attachment comes in contact with the sheave hanger, causing the middle portion of the flexible member to bulge upwardly. This forms a stop which prevents the folds of canvas from being drawn about the pulley. The device returns to its former position when the awning is again let down.



COMPACT ELECTRIC WATER HEATER OPERATED BY TAP

An electrical water heater has been designed which eliminates the necessity of a storage tank and confines all the heating apparatus in a metal case mounted just back of the faucet. The water is heated only as needed and immediately before entering the faucet. The same tap is used for cold water also. Inclosed in the metal case is a copper coil within which is an electrical heating element. When the faucet handle is turned to the side specified, it establishes electrical connection which warms the coils and heats the water as it passes in a roundabout way to the spigot. The temperature of the water varies with the amount of current used, which in turn is governed by whether the faucet is wide open or only part way open. These heating devices are made in various sizes which can supply from 30 to 1,300 gal. per hour. By turning the faucet handle to the direction opposite to that designated for obtaining hot water, no electrical connection is established and so cold water flows from the tap. The invention is coming into general use in certain parts of Europe.



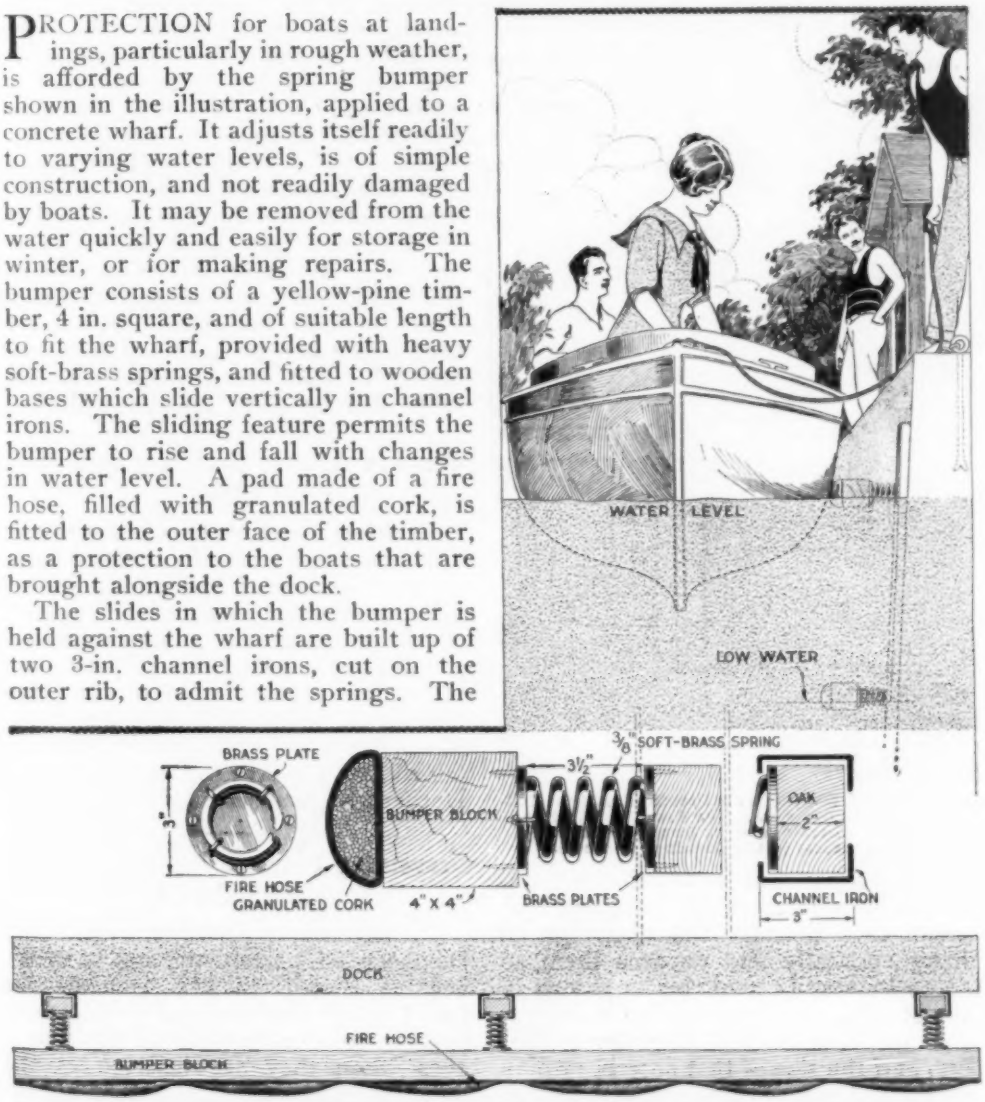
A, Cold Water Supply; B, Copper Coil; C, Electrical Heating Element; E, Electric Circuit; F, Circuit Closer; G, Handle of Faucet and Controlling Switch; H, Steam Dome

Spring Bumper for Motorboat Landings

By JOHN E. CAHILL, Jr.

PROTECTION for boats at landings, particularly in rough weather, is afforded by the spring bumper shown in the illustration, applied to a concrete wharf. It adjusts itself readily to varying water levels, is of simple construction, and not readily damaged by boats. It may be removed from the water quickly and easily for storage in winter, or for making repairs. The bumper consists of a yellow-pine timber, 4 in. square, and of suitable length to fit the wharf, provided with heavy soft-brass springs, and fitted to wooden bases which slide vertically in channel irons. The sliding feature permits the bumper to rise and fall with changes in water level. A pad made of a fire hose, filled with granulated cork, is fitted to the outer face of the timber, as a protection to the boats that are brought alongside the dock.

The slides in which the bumper is held against the wharf are built up of two 3-in. channel irons, cut on the outer rib, to admit the springs. The

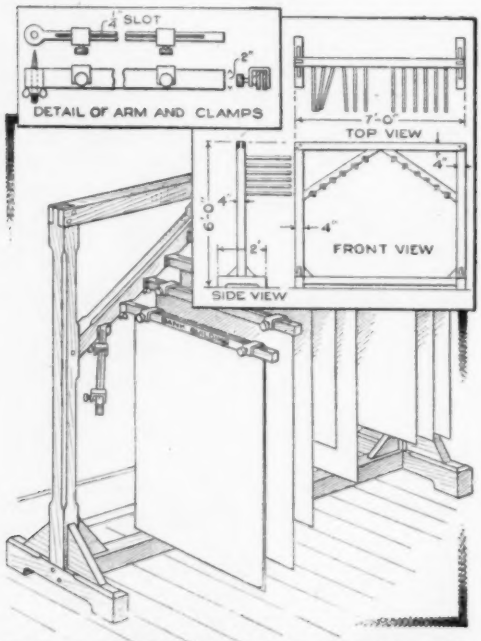


The Floating Bumper Protects Boats That are Docked at the Landing, and Is Readily Adjustable to the Varying Height of Water

guides are fixed to the wharf with screws, their heads being countersunk in the channel irons. The springs are set between brass plates, which are fastened, one to the timber which slides in the channel irons, and the other to the bumper block, at each spring. The sliding timber should be fitted into the guides with plenty of play, so that the bumper may adjust itself to the varying height of the water, or be adjusted with little effort.

Rack for Filing Drawings Vertically

Rolling up of large drawings for storage causes them to curl in an unsatisfactory manner when they are unrolled for reference. A filing arrangement that permits the drawings to hang vertically and exposes them so as to be readily available is shown in the sketch. The principle of construction involved may be used for a rack one-half the size of that shown, or may be extended to a larger one. It was designed to care for drawings and blueprints in an architect's office, and was found especially convenient when drawings were referred to frequently. The rack was placed so that all the draftsmen could reach it with a minimum of effort.



Drawings and Blueprints are Preserved, without Rolling Them, in this Rack. The Arms, in Which the Sheets are Clamped, may be Swung Horizontally, Making Access to the Drawings Convenient

The frame was built of 4 by 4-in. pine, dressed down on all sides. It was strongly joined and pinned at the joints, the floor supports being braced with triangular blocks. The racks on which the drawings are carried are suspended on the upper braces, and are arranged in a series so that the index, or title, on the strips between which the drawings are clamped, may be seen readily. A detail of the arms and the method of supporting them so that they may be swung horizontally, is shown in the small sketch above. Index slides are provided so that the titles of drawings may be inserted as required. The frame shown is substantial enough to carry a second set of racks on the other side. Since it was used against a wall, this feature was omitted. The frame, without a base, may also be fixed to the wall.

Concave Mirror Ground from Plane Glass

Desiring a spherical concave mirror of a given focal length, and not being able to find one, I had a lens grinder grind a concave surface of the same curvature that the spherical mirror would have to be, on the face of a plane plate-glass mirror. The concave surface on the plane back gave nearly the same result as would have been obtained by a concave spherical mirror.—Herbert N. Bradstreet, Phoenix, Ariz.

Preventing Screw Eyes from Rusting in Signboard

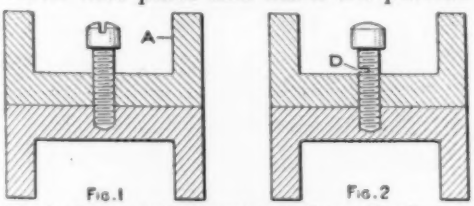
The screw eyes by which a signboard is suspended, particularly out of doors, become rusted quickly, causing the board to become loosened. White lead applied to the threads of the screw eyes when they are inserted in the wood, will prevent the rusting, which may also spoil the appearance of the sign by streaking it with rust.

Easy Method of Riddling Sand

Riddling sand or gravel for use in making mortar, and other binders, is a tiresome task when the ordinary hand sieve must be used. A good way of lightening the work is to use a rectangular sieve, provided with handles on one end. Nail two strips, about 1 in. square, across the top of the box into which the sand is to be riddled, leaving space enough between them for a roller slightly larger in diameter than the thickness of the strips. By placing such a roller between the strips and drawing the sieve back and forth upon it, the necessity of lifting the sand while riddling it is avoided.—Charles Darlington, Des Moines, Ia.

Screw-Riveting Kink

Occasionally two channel bars, or other members, must be joined together with machine screws in such a way that the heads of the screws will not project as shown in the illustration. Suitable flat-head screws may not be available, and the makeshift method of countersinking the work for another style of screw is not satisfactory. The heads may then be cut off, as indicated at D, Fig. 2. If the screw is driven into place before the nick is made in it, it is difficult to handle the job, because of the obstruction by the flange A. A good method then is to drive the screw into place and mark the portion

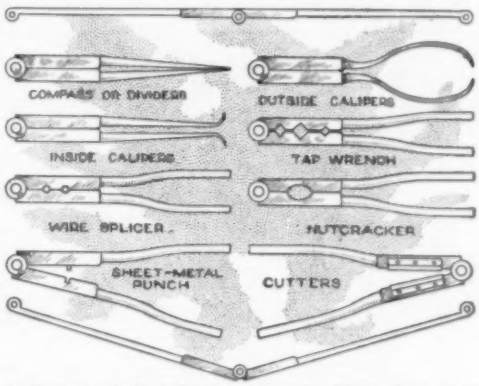


Cut the Groove before Putting the Screw Finally into Place, and Rivet the End After the Head is Broken Off

exposed. Remove the screw, and with a hacksaw cut about halfway through it, as shown. Then replace it and break off the head. The end may then be riveted into place, making a secure joint.—William Philip, South Orange, New Jersey.

Tools Made of Buggy-Top Braces

Many handy tools may be made from the jointed portions of buggy-top braces, and several suggestive uses are



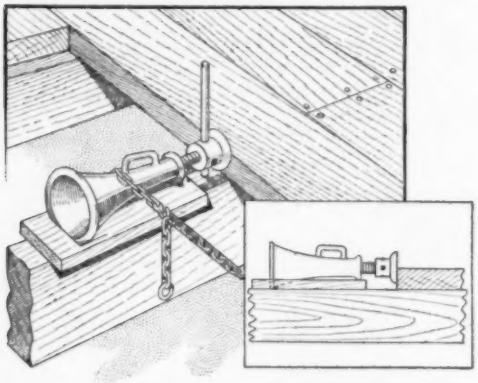
A Variety of Useful Tools may be Made from Old Buggy-Top Braces at Practically No Cost

shown in the sketch. By grinding the ends of the sections to points, a compass or dividers may be made; by forging them slightly, inside calipers, outside calipers, and similar tools may be made. By cutting appropriate notches into the jaws of the sections and fitting them with small pins as required, a nutcracker, wire splicer, sheet-metal punch, and a wrench are possibilities. Various types of cutters and nippers may be constructed from the sections by riveting blades to them, as shown at the right. The braces may also be used as clamps by fitting them with machine screws, or with bolts and wing nuts. By sharpening the points, as for dividers, and bending them slightly inward, the resulting tool may be used for spreading boards in nailing them by setting one point in each adjacent board, and bearing down on the hinge of the brace. Leather straps, or even carpets, may be stretched in this manner by using a board to increase the range of the device.—R. S. Matzen, Fort Collins, Colo.

¶ Emery wheels should be kept dressed up to give the best results, and the seeming waste of the wheel in dressing will be found an economy in time and satisfactory grinding.

Jackscrew Used in Laying Plank Floors

Heavy planks used in the making of floors frequently are not straight, and it is thus difficult to bring them together firmly by the usual kinks in drawing them into place, by setting the spikes properly. A small jack, rigged with a chain as shown in the sketch, was used effectively and saved the workmen much time and heavy labor. The jackscrew was fitted on a board having a notch near one end, so that when it was placed on its side the screw was horizontal, with the handle upward, and the head raised so that it could be turned by means of a handspike. The chain was placed around the floor joists, and over the handle of the jackscrew. By tightening the chain, with the head of the jackscrew against the plank, the latter was forced into place as firmly as desired. For each plank the chain and rigging was moved forward along the joist. If necessary it may be shifted from one place to another, or two or more jackscrews used at the same time, if the planks are long, and particularly crooked.—James Skelton, Toronto, Canada.



Heavy Planks are Forced into Place, Forming a Tight-Jointed Floor, by Means of the Jackscrew

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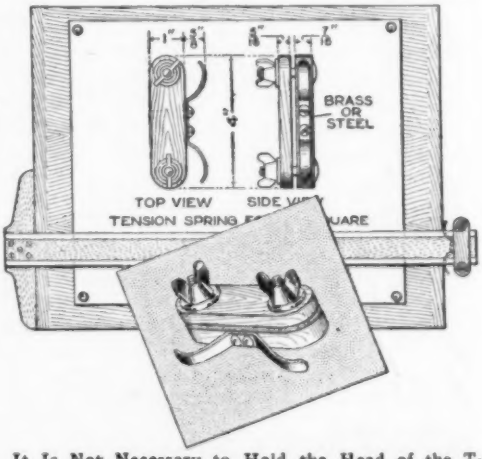
¶Leather machine belts should be cleaned with gasoline to give a good binding surface, rather than load them with belt grease, when they slip repeatedly.

String Solder Replaces Copper Wire in Battery Room

Considerable trouble was experienced in the storage-battery room because of acid fumes attacking the copper service wires. The life of the unprotected wires strung above the batteries was short; they became brittle and broke easily. To overcome the difficulty, the room was completely rewired, using string solder for conductors. This metal, being immune from acid fumes, was not corroded and showed no tendency to become brittle.—K. M. Coggeshall, Webster Groves, Mo.

Tension Spring for T-Square

The necessity for continual care in keeping the head of a T-square against the edge of the drawing board is obviated by the use of a tension spring on the other end of the square, as shown in the illustration. The action becomes that of a movable straightedge rigged to remain in a horizontal position, and the T-square may be quickly changed to its common form by removing the spring. The details of the device are shown in the working drawing on the drawing board.



It Is Not Necessary to Hold the Head of the T-Square Firmly against the Board When the Tension Spring is Used

The spring may be of brass or steel. The clamp is held firmly by means of two wing nuts.—Alphonse R. Desjardins, Cheyenne, Wyo.

The Woman's Home Workshop

By Avis Gordon Vestal

Part II—A Practical Kitchen for the Home with Children

[This is the second of three articles, in which Mrs. Vestal, "domestic engineer," sets forth the mechanics of the kitchen, illustrating fundamental design and details with practical examples. Each installment is complete in itself, but will be more fully appreciated in connection with the others.—Editor.]

REQUIREMENTS and needs typical of thousands of homes form the basis for the kitchen described in this article. The wife believes in children and has three bright "kiddies," ranging in age from six years downward. The husband has an income of $2,000 to $2,500 a year. The family moved from a city apartment to a suburb, to provide a safe play place for the youngsters, a garden for the special recreation of the head of the household, as well as for the other members, and an abundance of light and fresh air, denied them in the city flat. A floor plan of the kitchen and adjoining features is shown in the illustration. Above is a sketch in perspective, showing the pantry, and the children's alcove as viewed from the opposite end of the kitchen. Details of the exterior supply cupboard and refrigerator icing door, the sink and sink cabinet, guard for the screen door, and a curtain arrangement for the special benefit of the youngsters, who must "look out," are also shown.

With the home to pay for and the expenses of the growing children increasing each year, economy is necessary. The housewife wishes to put her kitchen work upon as efficient a basis as possible because she cannot afford to employ a "meat maid." A staff of "mechanical maids," and the weekly assistance of a laundress, is all the aid she can count upon. She has in mind the future as well as the present. Should more prosperous days arrive, she knows that it will be easier to employ and keep a higher-class maid, if the kitchen work is lightened by a conveniently arranged room. The new house has a furnace and all the community conveniences, such as water, sewer, gas, and electric service.

"The children insist upon following me to the kitchen," the mother declares, in stating her needs, "so I must have some suitable place for them there, where they can play happily, without being in the way. Besides, they are yet in that undeveloped age where civilization has not fully 'taken.' Little barbarians will have their differences of opinion which mother must arbitrate. I cannot supervise their training carefully if I shut them out of the kitchen where I must remain to work."

It is around this need to guard young children while attending to household cares that this kitchen is evolved. The mother can keep an eye on the little folks while they play in the house, and her windows are planned to give her a lookout station from which she can watch them in the yard. Though the room has nursery provisions, which will be required for some years, these features are not rigid and unchangeable, but quite adaptable. When the fledglings outgrow the kitchen alcove provided for them, it can be used as a breakfast room or to serve a simple noon lunch when but part of the family is at home.

Should the husband's "ship" come in,

with a servant on board, the alcove can be converted into the maid's dining room. Other possibilities of future development are a sewing room or a rest corner with a couch or rocker, or a kitchen "office" with desk and library of household books and magazines.

The long box seat is to store the precious toys, keeping the living rooms free from the clutter so often found in small houses where the mother is both mistress and maid. It also forms a seat before the table which is used for play and for serving the frequent small meals required by children. Above this table the wall supports a small set of shelves for the dishes used daily for the bread, milk, and cereals.

One who is familiar with children knows that when they are house-bound on stormy days they are continually pulling aside the drapery curtains to look out, a very natural impulse, which causes rumpling and soiling of the curtains. To permit unobstructed view, admit abundant sunlight, yet have some soft framing, these windows are given narrow curtains gathered in snugly at the top and bottom by rods, and the folds pulled back to within 6 in. of the window casing. Gay-flowered cretonne is used, brown and yellow stocks on a cream ground, a split strip at each side. The effect of the alcove is almost like looking into a flower garden, even though snow be in the air without. The windows are casements and are completely screened. The seat permits the juniors to clamber easily up to the flower-framed lookouts. A chair for mother and a high chair for the baby complete the furnishings of the nursery.

The "cook's corner" is the second section of this home workshop. It is a combination of a pantry and a kitchen cabinet. It is, in fact, what might be called a "wide-open" pantry, since its two doors open practically the entire storage space, when in use. The built-in refrigerator is filled from the screened back porch, and has a delivery station above it to receive foods and milk. Every housekeeper knows what a nuisance it is to have the grocery boy open the door, unannounced by a preliminary knock, and leave a trail of muddy footmarks across a freshly scrubbed floor. If the door is kept locked, the housewife is likely to be called down from the bedrooms or up from the laundry to let him in. Sometimes she is away when deliveries are made and the milk sours in the summer sunshine or the bananas freeze in the cold. Again, few kitchens have a place to receive supplies until they can be checked up and put away, and they are often piled in the middle of the worktable while the biscuits are being rolled out.

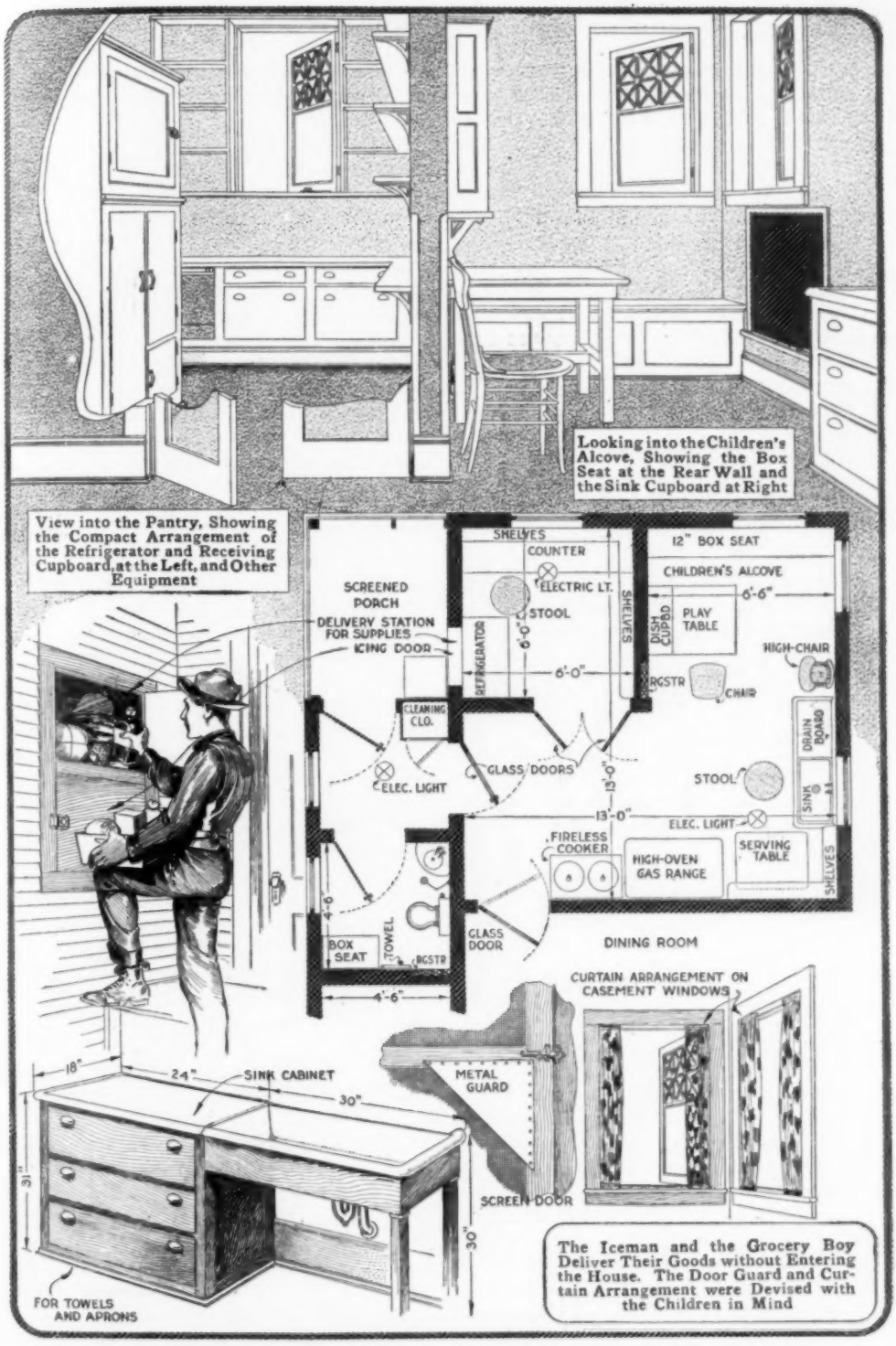
With such an array of reasons to back it, I invented this case to care for them. The top of the refrigerator is its floor; the sides and top are of wood, and it has glass doors both at the front and back, either or both of which can be locked. The transparency of the doors is for two purposes: One can glance in to see whether supplies have arrived and also peep through it when the youngsters are playing on the porch.

The east wall has a work counter across it, with storage beneath and above at both sides of the window. The high shelves are for jelly. The large low shelf is for the bread mixer. On the south wall, from counter height upward, are narrow open shelves, hooks for utensils being placed beneath the lower one.

A secondhand office stool, cut to the housewife's needs, and having the four legs shod with sliding metal casters to make moving easy and silent, is used during most of the cooking preparation. Its further merit is a seat broader than is made for many kitchen stools, the larger seat being more comfortable.

"I had enough of dark rooms while we lived in apartments," the housewife explains, recalling the air wells of earlier years, "so I want glass in the upper part of my back door. That will be as good as another window."

This door, with the several windows, makes splendid ventilation on warm days. The dining-room door also has a glass pane to prevent collisions. It is double-acting, can be anchored open



This Kitchen was Designed to Lighten the Manifold Duties of the Mother and Housewife. The Alcove and Porch Provide Play Space for the Children, so That the Mother may Be at Ease over Their Safety. The Pantry Provides Ample Storage Space and a Work Counter

when serving meals, and has no raised threshold. Through it a wheeled serving table, details of the construction of which will be given in the final article, rolls easily.

Separated from the cabinet corner only by a comfortable path is the wall given over to the cooking processes. It is a general rule of kitchen planning that the more fully all wall space is utilized the less floor space will be required. A smaller room means less cost to build, less labor in cleaning and fewer steps in routing the work. The gas range chosen is of the high-cabinet type, the oven being too high for the fingers of childish curiosity. The side-oven type of cabinet range is equally convenient in use, but takes more floor space.

The small space needed for the stove leaves room by its side for a two-compartment fireless cooker, raised upon a homemade stand, which holds utensils. The use of the cooker cuts down the gas bill and makes a cooler room in summer, for even the best of gas ranges raises the temperature of the room and of the cook, when the oven is used in warm weather. The further merit of the fireless stove for a cook whose mind is much interrupted by childish activities, is that food in it does not require watching lest the roast get dry, the vegetables boil over, or the cereal scorch.

This brings out an important point in household efficiency: the conservation of the housewife's nervous energy. This is quite as important as the saving of time or of steps, as vital to the welfare of the family as the saving of money. Some kitchens waste much nervous power. The safe play places, indoor and out, with the window outlooks for the mother, make child care less exacting in its demands on nerve force. The abundant light and air serve in part the same purpose. The selection of an inlaid linoleum as the floor covering was made primarily because it is elastic and will deaden the noise of pattering feet, though its ease of cleansing also is a factor.

Along with conserving muscular and nervous strength, in the design of a kitchen, the effect of color and line in its decoration may well be considered. It is easier to work in a pretty room than in an ugly, irritating one. A combination of colors, all beautiful, but fighting in combination, is far from restful. Large spaces of red, as in the walls, are irritating to the senses because they overstimulate the nerves of sight. Large figures in a linoleum on the floor seem to rise up and hit the observer, instead of keeping the floor subordinate and in its place. This kitchen has washable painted walls, the lower portion brown as high as little hands can reach, the upper wall and ceiling a warm tan. The linoleum is of the same two colors, in a small-tile pattern. The room is so sunny that it could have been developed nicely in light gray with a blue and gray linoleum, and blue in the pattern of the window draperies.

The arrangement of the dishwashing corner will, doubtless, take much of the drudge out of this task. The use of the serving table, set at right angles to the sink, holding the soiled dishes ready to be washed and routed from right to left, has some mechanical advantage as compared with a table or second drainboard set in the usual line against the wall. The customary arrangement is satisfactory when one stands and walks before the group, but when one sits upon a stool the right-angle arrangement makes things easier to reach without rising.

Setting the sink bed 30 in. high would have been correct in this house had its mistress intended standing at the dishwashing. As she is learning that if everything is studied out and properly arranged, she can work quite as well from a stool, she can use a lower sink to advantage. Her drainboard will be 30 in. high, the table top the same, and the height of the sink bottom and the top of the stool 24 in. A set of drawers beneath the drainboard holds towels and aprons.

When slow cooking is to be watched, as the stirring of jam, the sink stool is moved beside the range. When a meal

is being dished up, the wheel table is rolled up to the stove with the serving dishes ready upon it.

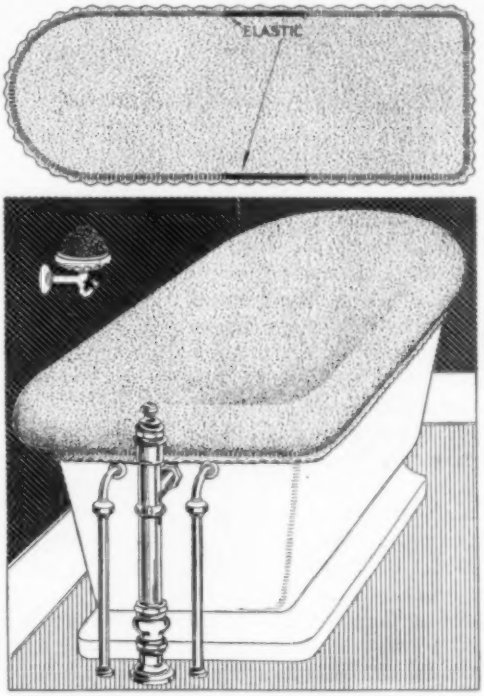
The bedrooms and the regular bathroom are all upstairs, so there was a need for a supplementary toilet room on the first floor, as this will save many trips up and down stairs every day. Here the play wraps and rubbers are stored, the first upon low hooks, the latter in a box seat upon which the older children can sit to put on their rubbers. The younger children stand upon it while mother fastens their wraps, saving her some stooping. There is a much-needed comfort station, and a lavatory where smeared baby faces and grimy little hands can be freshened up after play. The screen doors are provided with a metal guard to protect the wire from the destructive hands of the children, as well as to prevent injury to the prying hands. A detail of the guard is shown in the illustration.

The 6-in. shelf, around the southwest corner of the kitchen, beneath which the wheeled table usually rests, "feeds the cooking" by bringing close to the stove the salt, pepper, soda, matches, shortening, and other things used daily in attending to the cooking. Beneath are hooks for implements used in serving up the food, as the potato masher and puree sieve. Nearer the sink itself, as the shelf turns to the south wall, are found cleaning preparations, as steel wool for polishing aluminum utensils, silver polish, sink brush, water softener, knife-scouring cork, and the like. Beneath, on hooks, hang the towels and dishpan.

The hot-air furnace has wall registers in the lavatory and kitchen, that for the latter at the joining of the two alcoves. The path between the two doors of the kitchen is a short one. A closet for broom, dustpan (a long-handled one), chemical mop, wet mop, scrub pail and related cleansing tools, is provided in the entry, just outside of the kitchen door. A bench on the porch holds a sanitary, covered metal garbage can. Plate scrapings and vegetable parings are freed of liquid in a sink strainer and are emptied into the can, which is scalded daily. Beside it is a basket to receive tin cans and broken dishes, which are carried twice a week to the back gate on the days the collector comes.

Dust Cover for Bathtub

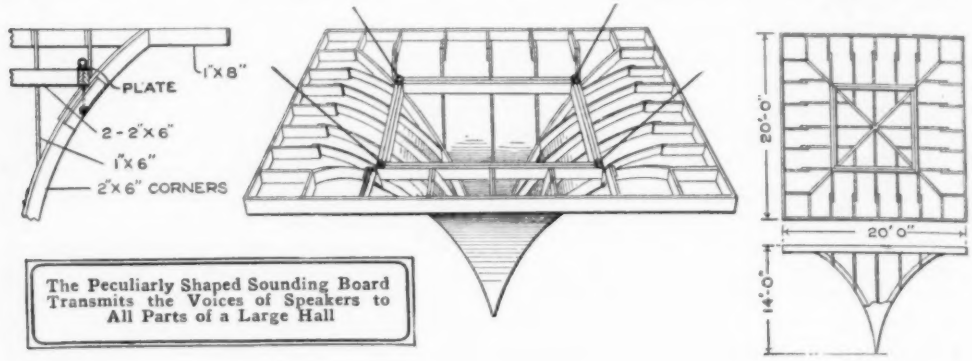
The task of keeping the bathroom scrupulously clean is a difficult one at best. While it is desirable to have the windows of the room opened for airing frequently, the result is often the undoing of much labor, by the blowing in of soot and dirt to mar the clean, white fixtures. By fitting a cover of washable cloth over the tub, as shown in the sketch, particularly while the bathroom is being aired, the enameled surfaces may be protected. The cover, being fitted with a drawstring to fit under the roll edge of the tub, may be removed quickly, and as easily replaced.—L. J. Hough, Toledo, Ohio.



The Cover Protects the Bathtub from Dust and Saves Much Labor in Cleaning

Sounding Board for Large Auditorium

The problem of carrying the voices of speakers to a capacity audience, in one of Chicago's largest convention halls, was solved with great success by the installation of a sounding board in the form of an inverted concave pyramid. The construction of the device, as shown in the sketch, is simple, and may be adapted to various other uses, particularly where a sounding board is required for either indoor or outdoor assemblies. The board was supported from the roof girders by means of four guy wires, fixed to a heavy frame, which formed the chief support of the framework. The curved surfaces were covered with composition board, a layer of muslin, and shellacked with several coats, to produce a close but resilient surface. The speaker's position was slightly to the rear of the point, the latter being about 6 ft. above the speaker's head. The curved surfaces receive the sound waves and transmit them to all parts of the auditorium, without echo.



The Peculiarly Shaped Sounding Board Transmits the Voices of Speakers to All Parts of a Large Hall

The foundation for the composition board is a typical framed structure. The center sketch shows a general view as seen from above; at the right is a framing diagram, and at the left is a detail of one corner, showing how the supporting frame, of double 2 by 6-in. stock, is bolted to the corner rafters, the latter being reinforced with fish-plates. The device as illustrated is 20 ft. square and 14 ft. high. The corner ribs are of 2 by 6-in. stock, and the intermediate ribs are cut to the proper curve from 1-in. material. Lookouts are nailed to their upper ends, and a plate of 1 by 8-in. stock faces them around the outer edge. The eyebolts, supporting the guy wires, are fitted through steel plates, over the corner joints in the supporting frame, as shown in the detail at the left.

Fastening Washer upon Wood Without Screws or Nails

In fitting a thin sheet-metal washer, or bearing, to a wooden surface, it is often desirable to fix it into place so that it will not revolve, and still leave the surface unmarred by screws or holes. A satisfactory method is to turn down a small triangle at each corner of a square washer and drive these points into the wood. If round washers are used, small nicks may be cut into the edge and the resulting corners turned down and set into the wood.

Drills Made from Hacksaw Blades

Broken hacksaw blades may be ground into satisfactory drills for boring small holes through thin material or for drilling shallow holes. The steel blade should be broken into short sections and the ends ground to standard sizes not larger than $\frac{3}{16}$ of an inch. The point is ground like a straight-fluted drill. The drills may be held securely in a brace having two parallel jaws.

Cleaning Automobile-Engine Cooling System

To clean the cooling system of an automobile engine, drain off the water from the water jacket and connections, by means of the petcock provided for that purpose. Pour a solution of two handfuls of washing soda to a pail of hot water into the system. Run the engine for a few moments to stir the mixture thoroughly throughout the system, and then drain off the soda solution. Permit clean water to flow through the radiator until it brings no more sediment with it, and then fill the system with clean water. This method removes all rust or grease effectively from the radiator and its connections.

Gauge for Cutting Packing-Box Stock

The gauge shown in Fig. 1 was made to provide a convenient method of measuring duplicate pieces for packing boxes, made from miscellaneous stock from time to time, in a shipping room. The articles to be packed were largely of several standard sizes and the gauge was designed first to fit the necessary boxes. It consisted of two strips of wood joined at right angles, and having indications for the length and width of the pieces. A later development was the attachment of the adjustable

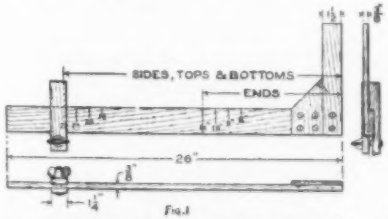


Fig.1

This Simple Gauge Aided in the Cutting of Stock for Boxes of Sizes Much Used

arm, by means of which various odd-sized pieces could be gauged. Figure 2 shows a gauge with metal fittings, and indications readily applicable to various sizes of box stock. Indications for the lengths of pieces for standard-size boxes are shown in the spaces marked "Ends" and "Sides." Other sizes are gauged by the use of the scale.

The adjustable arm is fitted to slide on the scale rod, and is tightened into place by a knurled thumbscrew. The

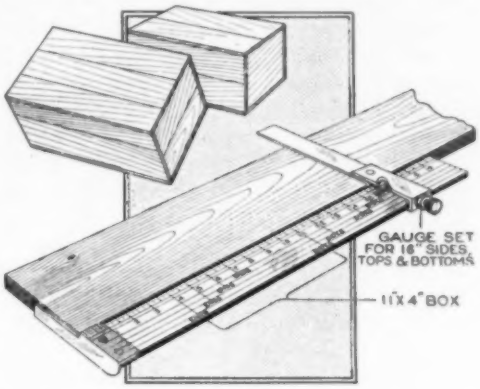


Fig.2

Stock for a Large Variety of Boxes may be Gauged Quickly with This Device

arm is used as a square in marking the end to be cut off. The metal fittings are of 1/16-in. sheet brass. The arm is riveted where the portion of the strip looped over the scale rod joins the straightedge. The thumbscrew operates in a hexagonal nut soldered to the end of the loop.—John M. Pipp, Muncie, Ind.

Setting Screws in Making Metal Patches

Liners for revolving or sliding machine parts are usually applied with patch bolts, which sometimes become loosened, causing serious damage. This can be readily prevented by cutting a small notch at the upper edge of the countersunk seat for the head of the bolt, and when the head is in place, riveting the edge of it into the notch. This prevents the bolt from becoming loosened, and, if it is desired to remove it, the riveted portion may be chipped off. Care must be taken not to strike the screw too hard, as the thread may be damaged, only a slight riveting being necessary.

¶The bearings of a magneto should be oiled sparingly.

Simple Tree Repairing

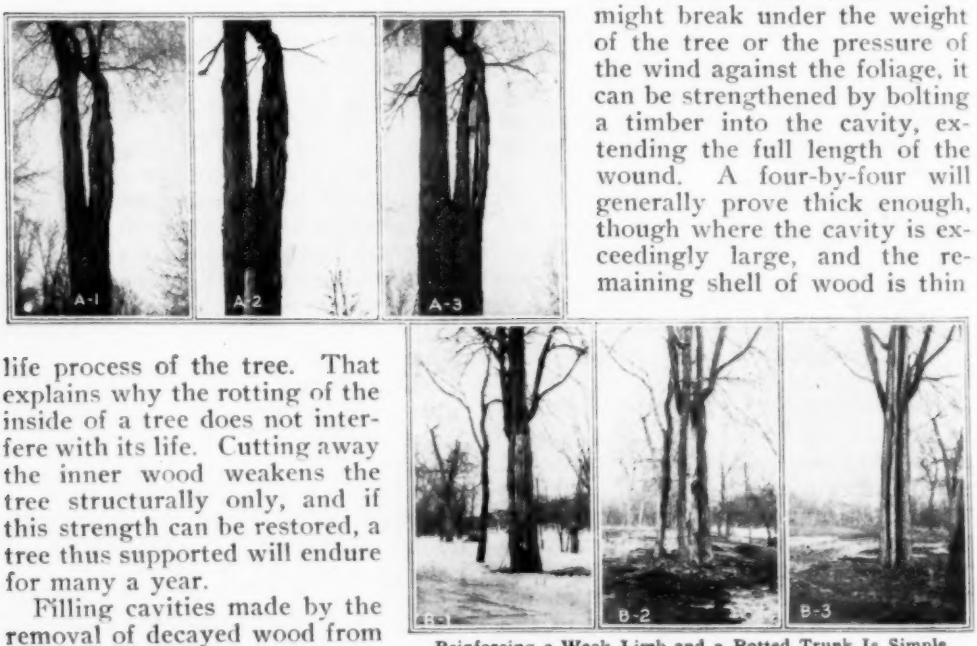
By C. L. MELLER

OFTEN a tree that appears to be ready for the ax can be saved for many a year by the simple process of removing the decayed wood, and, where necessary, strengthening the remaining parts. The nature of the work is such that a person with reasonable skill in the use of carpenter tools can do a satisfactory job, providing he acquaints himself with the fundamental structure of the tree.

The photographs, reproduced in the illustration, show trees repaired by bracing them with wood. Three stages in the process are indicated, for a repair on an upper limb at A, and on the main trunk at B. The stages are: 1, faulty tree; 2, cavity cleaned; 3, cavity filled with wood brace. The part of the tree trunk or limb essential to the tree's life is the thin band of green just below the bark, and a thicker layer of the sapwood behind it. The rest of the inside of a trunk or limb represents strength and does not function in the life process of the tree. That explains why the rotting of the inside of a tree does not interfere with its life. Cutting away the inner wood weakens the tree structurally only, and if this strength can be restored, a tree thus supported will endure for many a year.

Filling cavities made by the removal of decayed wood from a tree with concrete, asphaltum, or similar substance is good, but requires a technical knowledge that none but an expert along this line possesses. Such work poorly done is worse than useless, and it is not necessary to resort to the filling method to get satisfactory results. The punk and decayed wood must first be removed from the cavity, and the exposed surface permitted to dry out for several days. Then the work should be gone over again, leaving nothing but the soundest of wood with a surface almost as smooth as if it had been dressed down with tools. Painting the cavity with boiled linseed oil, into which a little burnt umber has been stirred, will prove a good protective covering, but needs to be renewed at least once a year to be permanently effective. The burnt umber produces a natural brown color, that makes a hollow in a trunk or limb quite inconspicuous.

If there arises the least suspicion that the cavity leaves the trunk or limb in a condition so weak that it might break under the weight of the tree or the pressure of the wind against the foliage, it can be strengthened by bolting a timber into the cavity, extending the full length of the wound. A four-by-four will generally prove thick enough, though where the cavity is exceedingly large, and the remaining shell of wood is thin



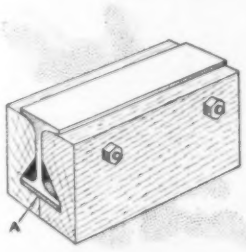
Reinforcing a Weak Limb and a Rotted Trunk Is Simple by the Method Shown

a timber of greater dimensions should be used. A sound pole of some of the stronger woods makes an excellent reinforcement. Thus, at times, a small tree that is out of place and is to be cut down may serve as reinforcement for a larger tree that may be saved for a number of years. There is usually sufficient strength at both ends of such a cavity to resist all stress and strains that may be put upon them, while the weakest part is along the middle.

The bolts used should be thick enough to give ample strength, but must not be so thick that the hole required will materially weaken the timber used. They should be no longer than is necessary. Washers are used to provide a good bearing surface, and should be countersunk slightly below the bark. A weakened limb may be further strengthened by tying it to several other limbs with a chain or cable and bolts. In no case, however, must a chain or band of iron encircle a limb. An eyebolt is placed through the limb and the chain attached to it.

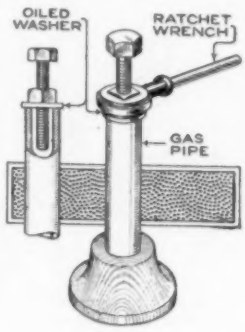
An I-Beam Anvil

An I-beam may be made into a serviceable and almost noiseless anvil if fitted with a wooden casing, as shown in the sketch. A section of the beam, about 2 ft. long, is squared on the ends, the rough edges removed, and two holes for bolts drilled through it, about 6 in. from each end. The case of wood is made from two oak, or other strong wood, blocks, and the inner faces are cut to fit the flanges of the beam, as shown. A pad of leather, A, is fitted under the beam, and the parts are bolted together firmly. If the leather pad is fitted closely and the wooden case is brought up tightly by means of the bolts, there will be little noise produced when the anvil is used.—James E. Noble, Toronto, Can.



An Improvised Lifting Jack

The need of a device for lifting comparatively light objects or constructions while leveling them is often felt, and a jackscrew is not always available. Materials at hand in most small shops were used to make the improvised lifting jack shown in the sketch, and it proved satisfactory enough to warrant keeping it for future use. A section of 1-in. pipe was fitted into a wooden block as a base, and a washer was set on top of the pipe. A large machine screw and a nut to fit it were set through the washer, as shown, and a ratchet wrench was applied to the nut. An ordinary plain or monkey wrench may be used, the ratchet wrench being more convenient, and in this instance available.—John Uttley, Hale, Cheshire, Eng.

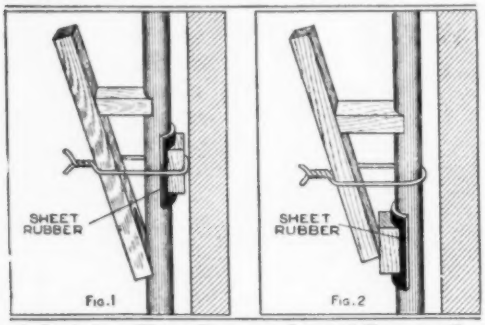


Revolving Tool Rack

In small shops, or other places where it is desirable to economize tool space, the revolving tool rack shown in the sketch may be installed to advantage. A round rod was set into a plate fixed on the bench, and its upper end supported by a metal brace, B, fixed to the wall. Two round wooden disks, A, with holes for the tools, are supported on the rod, and may be revolved to make access to the tools convenient. Metal disks may be used, and will be more serviceable than the wooden ones.—H. W. Offins, Grants Pass, Ore.

Temporary Repair for Pipe Leak

Leaks in water pipes, particularly in winter, cause much damage unless stopped promptly. This is often difficult, as a plumber's services are not always quickly available. Under such circumstances, the device shown in the sketch was used to stop a leak until a permanent repair was made. A piece of sheet rubber was placed over the leak, and a wooden block was fitted over it, the inner surface being curved to fit the pipe. The block and rubber packing were clamped against the pipe by means of a stick, notched to fit against the pipe, and held by a twisted wire, a block being used to wedge the packing and cover block firmly into place. The repair was water-tight and saved much inconvenience and probably considerable damage. The illustration shows the application of this method to two types of leaks, Fig. 1 being a leak difficult of access, against a wall, and that in Fig. 2 on the exposed side of the pipe.—J. W. Cox, Florence, Alabama.



A Leak in a Water Pipe was Stopped Temporarily by the Use of a Simple Clamping Device

Keeping Auto Top Down Saves Gasoline

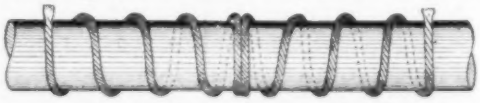
The practice of running an automobile with the top up when it is not needed, is costly, according to tests which I made. When the back of the top cannot be rolled up, the resistance is especially great. Six miles more were obtained from a gallon of gasoline with the top rolled and covered, as compared with having the top up with the back closed. When going against the wind, this extra pull is especially heavy, and difficulty in making a hard climb may often be relieved by lowering the top. Careful regulation of the top, using it only when essential, will be found to be a worth-while factor in reducing the gasoline bill.—L. E. Turner, Jamaica, N. Y.

Overcoming Floor Vibration under Scale Platform

Scales, set on the floor of a shop or other place, where machinery, passing traffic, and other disturbances, cause considerable vibration, cannot be used with satisfaction because of this condition. This trouble was overcome by providing the scales with a hollow cast-iron base, having ⅜-in. walls, so that the scales were raised to a more convenient height for using them, in weighing objects of no great bulk. A square piece of live rubber, ½ in. thick, was placed as a foot at each corner of the base, and this took up the floor vibrations.—M. E. Duggan, Kenosha, Wisconsin.

Making Oil Grooves in Babbitt Bearings

Oil grooves may be provided in babbitt bearings by wrapping a piece of cord around the shafting which is to fit the bearing, as shown in the sketch. The cord should be wrapped spirally in two directions from the center of the bearing toward the ends, so that the oil will be carried toward each end from the oil hole, when the shaft revolves. The babbitt is poured around the shaft and incloses the cord, which is withdrawn when the metal has cooled.



Oil Grooves may be Cast in the Bearing by the Use of a Spiral Cord

Copper nails and screws are best for boats and other marine purposes.

Machinery Foundations With Anchor-Plate Pockets

By TERRELL CROFT

SETTING heavy machinery, or removing it from foundations, is accomplished more readily when the anchor bolts are arranged to be inserted or taken out after the machine is in place. This may be provided for by pockets in the foundations, so disposed that headless anchor bolts project into them, at their lower ends, the anchor plates and nuts being accessible in the pockets, as shown in Fig. 1. This method of construction is adaptable to a large variety of foundations, of materials in common use; details of several typical applications are indicated in the sketches. The bolts are incased in metal pipes, built into the foundation, and providing a convenient method of inserting them. The pockets may be formed by the use of wooden forms, stone slabs, cast into the foundation, as shown in Fig. 6, bricks and iron slabs, Fig. 8, and, when the number of pockets makes it advisable, pocket castings of iron may be inserted, as shown in Figs. 10, 11, and 12. The method of setting the bolts to fit the bolt holes in the machinery is detailed in Fig. 13, and shown also in other sketches, the upper ends of the bolt casings being set into templates.

The function of an anchor-plate pocket is to permit the withdrawal or insertion of an anchor bolt when desired. The provision of pockets permits the insertion of anchor bolts in a foundation after the foundation has been completed. It is frequently desirable to build a foundation without the anchor bolts in it, so that their projecting ends will not interfere with the installation of the machinery on the foundation. In such instances, the foundation must be "pocketed." Occasionally a foundation bolt is broken and must be replaced. Such replacements are exceedingly difficult unless pockets are provided. Sometimes it is not feasible to place the anchor bolts in a foundation when it is being constructed because the bolts are not immediately available, and a pocketed foundation must then be used. As is quite evident, pockets are used only where the anchor bolts are removable.

Large foundation installations justify the provision of pockets for the nuts and anchor plates, because with all large foundations it is exceedingly expensive to replace an anchor bolt if one is broken, unless pockets are provided. Anchor bolts in large foundations frequently extend a considerable distance above the top surface of the foundation, and materially interfere with the skidding of the machine onto the foundation. Where bolts are removable, that is, where pockets are provided, such interference can be eliminated.

There are really two kinds of anchor-plate pockets, accessible and inaccessible. An accessible pocket is one that opens to the outside of the foundation, so that the lower end of the anchor bolt is always accessible. An inaccessible pocket is merely a cavity under the anchor plate to accommodate the end of the anchor bolt that extends through the nut. The accessible type is the more frequently used because an inaccessible pocket may become clogged with rubbish, falling in from the top of the foundation, whereby its purpose is defeated. Only pockets of the accessible type are considered in this article. Accessible pockets are sometimes called handholes; they are recesses, or chambers, extending from the side of a foundation, as shown in Figs. 1 and 2, to a point somewhat be-

yond and directly under the anchor plate and bolt. In the case of a large foundation, instead of extending from the side of the foundation, the chambers may open into a tunnel through the foundation. Such tunnels are frequently provided to admit access to the anchor-plate pockets.

The location of the pockets in a foundation must be determined in each specific installation. It is difficult to outline any general rule. It is usual, however, to make foundation bolts extend almost to the bottom of, or for a distance at least equal to 40 times the diameter of the anchor bolt into, the foundation. This means that the pockets will nearly always be near the bottom of the foundation. Where a foundation is constructed on a footing, as indicated in Fig. 3, the top surface of the footing frequently constitutes the bottom of the pocket cavity. It is obvious that the location of the pockets in a foundation will be in any case largely determined by the length of the foundation bolts.

In removing an anchor bolt from a pocketed foundation it is only necessary to unscrew the anchor bolt. If the pocket is accessible, the nut can then be removed from the pocket, and a new nut substituted, if desirable. Anchor bolts for pocketed foundations consist, in practically every case, of mild-steel rods threaded on both ends. An anchor bolt with a head forged on its lower end could, of course, not be removed.

Pockets in brick foundations are constructed as shown in Fig. 3. In building the foundation, a cavity is left in the brickwork as diagrammed, and from this cavity, extending vertically upward, a shaft, which provides a casing hole for the future insertion of the foundation bolt, is arranged. To support the brickwork above the pocket cavity, a slab of wrought or cast iron, or of stone, is used. If an iron slab is utilized, it should be proportioned of sufficient thickness to constitute an anchor plate, rendering the use of an additional anchor plate unnecessary. Cast-iron anchor plates, of the standard types used in foundations, can often be applied instead of an iron slab. Where the slab is of stone, an anchor plate should be used on the lower end of the foundation bolt, as shown in Fig. 2, to distribute the pressure transmitted from the anchor bolt to the stone slab. Boiler-plate steel, of sufficient thickness, can often be obtained from junk dealers at little cost, and where such can be procured, a rectangular piece, with a hole drilled through it at the proper place, constitutes a splendid roof slab for the pocket in a brick foundation. Pockets in rock or stone foundations are constructed in practically the same manner as those for brick, as illustrated in Fig. 3.

Pockets in concrete foundations are subject to more variation in design and arrangement than are those used in brickwork. Figure 4 shows the arrangement and construction of a typical concrete-foundation pocket. It is usual in concrete foundations to place a footing which covers the entire bottom of the hole that has been excavated for the foundation. Then the foundation proper is built up on this footing. Ordinarily the bottom of the pocket hole is the top of the foundation footing, as shown in Fig. 4. A form is necessary where a pocket is to be cast into a concrete foundation. Forms of different types are shown in the sketches and merit detailed discussion.

A wooden form, for a pocket and a casing hole, is shown in Fig. 5 in position in the foundation, with the concrete cast around it. Where an iron-tube casing is not used for the foundation bolt, the construction suggested in this illustration is a good one. The casing form is supported at its upper end by the template. The top piece of the pocket form is nailed to its lower end, and is supported at its sides, back, and front, with pieces of board, which constitute the form for the pocket walls. While the front board of the pocket form—that at the access side of the pocket—serves partly to support the weight of the concrete, which rests on the top piece at that point, it is always desirable to secure the pocket form to the foundation form by nails

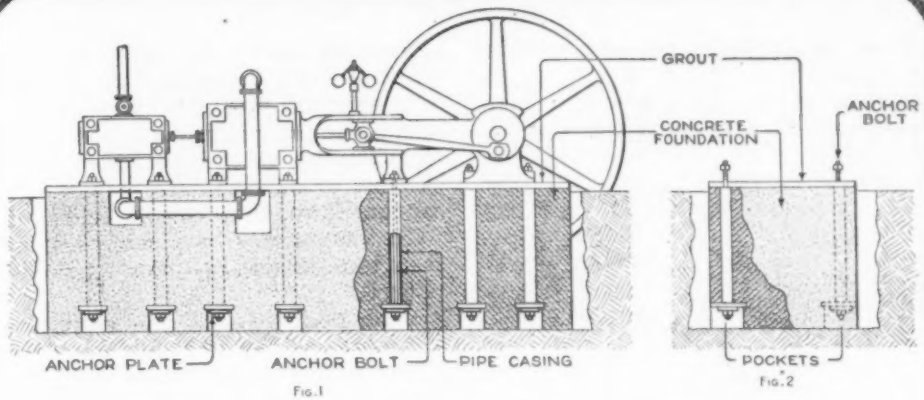


Fig. 1 Fig. 2

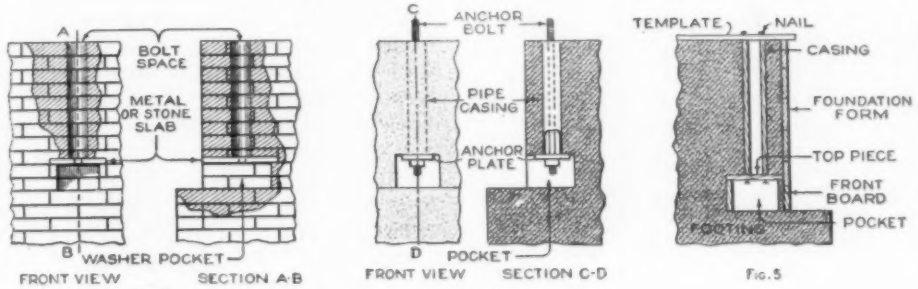


Fig. 3 Fig. 4 Fig. 5

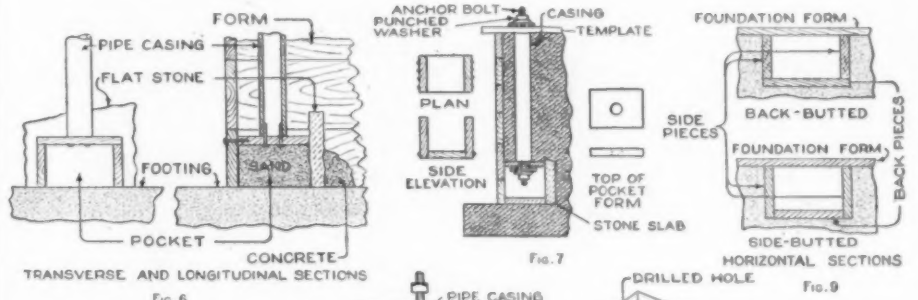


Fig. 6 Fig. 7 Fig. 9

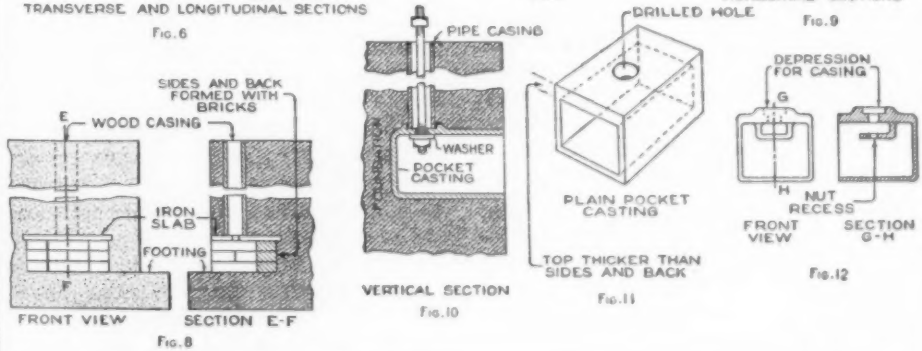
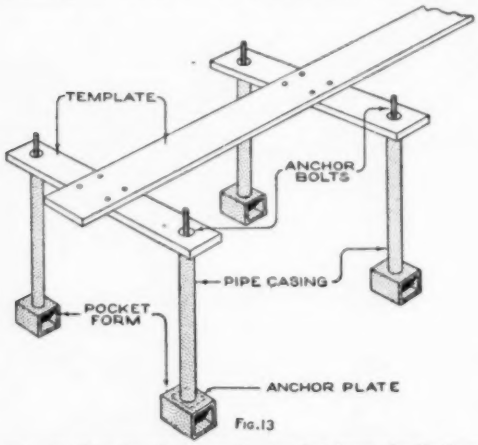


Fig. 8 Fig. 10 Fig. 11 Fig. 12

Anchor Bolts Fitted into Pockets in Machinery Foundations Permit the Convenient Setting or Removal of the Machine. The Application of This Type of Construction to a Variety of Materials—Concrete, Brick, Stone, and Combinations of These—Is Shown in the Sketches

driven in from the outside, as illustrated in Fig. 3.

Forms for pockets, where a metal casing is to be used for the anchor bolt,



The Pocket Castings are Suspended from the Casings and Bolts, Fitted to the Template

are shown in Figs. 6, 7, and 8. In these examples the form for the pocket is fixed to the bolt casing, so that the latter may serve, in part, as a support for the form.

It is desirable to arrange the pieces of board, constituting the pocket form, so that they can be removed easily after the foundation has set. If, in building a pocket form, it is so constructed that the backboard butts against the ends of the two side pieces, the latter can be removed easily, after the foundation has set, as shown above in Fig. 9. The back piece, however, will probably be difficult of removal, because the concrete will bind at the ends of the piece. If the end pieces are side-butted, as shown below, the pocket form can be pried out of the foundation easily, after the latter has set.

Stone slabs are often used to form the backs of pocket forms, to obviate the difficulty in removing the pieces of the form. Figures 6 and 7 illustrate pocket forms having stone-slab backs. The sides of a pocket can also be made of stone slabs, if slabs of the proper dimensions are available. The stone is, of course, permitted to remain in the foundation permanently.

Sand may be used for filling in pocket forms, as shown in Fig. 6, to prevent the possible collapse of the form, before the concrete has set. Where sand is used, the form is filled to the brim before the top board is placed in position. Where stone slabs are employed in a pocket form, they can be held in position temporarily by placing a lump of concrete outside of them, as shown in Fig. 6.

The pocket forms and casings may be joined as indicated in Figs. 6 and 7. The casings must be available when the concrete is being poured, and they can be used to support the top board of a pocket form, as shown in Figs. 7 and 13, if the foundation bolts are at hand. The casing is cut to a length exactly equal to the distance between the top of the foundation and the roof of the pocket, as shown in Fig. 7. The upper end of the anchor bolt is located accurately in the foundation form by a template. The casing is arranged concentrically around the bolt, and is clamped between the bottom face of the template and the board which forms the top of the pocket form. If the sides of the pocket form consist of wood pieces, they may be prevented from collapsing, as shown in Fig. 7, by another board nailed between them at the bottom, and by nails driven into them, through the top board.

It should be noted that, with the arrangement described, the anchor-bolt template locates the casings and the positions of the pockets, and that the elevation of the tops of the pocket forms is determined by the length of the casings. If the template is laid out correctly, and the casings are cut accurately to length, the pocket forms locate themselves almost automatically, both laterally and vertically. With this procedure, there is little chance for error, and the concrete men have to make but few measurements.

Bricks can be used to make pocket forms, as shown in Fig. 8. Where this method is utilized, the construction of practically all form work is avoided. A metal slab may be used as a form for the roof of the pocket. It can be supported by an anchor bolt. In building

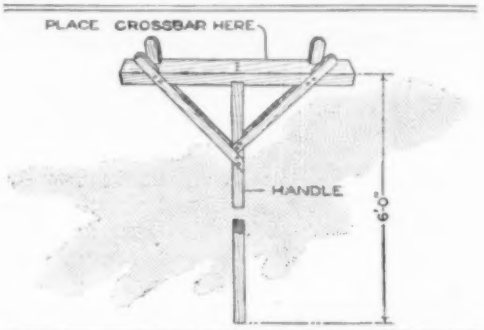
a pocket of this type, the bolt casing and the slab constituting the top of the form, are first suspended from the template. Then the brickwork—sides and back—is built around the edges of the slab. The sides are built first and braced inside with bricks temporarily placed, or with pieces of board. Then the back is built.

Cast-iron pockets can be used, as shown in Fig. 10. These pockets, or castings, detailed in Figs. 11 and 12, may be made to serve both as pocket forms and anchor plates. They, of course, remain in the foundation permanently. The simplest type of anchor-bolt pocket casting is shown in Fig. 11. It is merely a cast-iron box, with one open side, and a hole drilled in its top for the accommodation of the anchor bolt. Where such a casting must also act as an anchor plate, its top should be thicker than the sides and bottom, as suggested in the illustration, so that it will withstand successfully the stresses imposed when the anchor-bolt nuts are tightened. A more elaborate casting is shown in Fig. 12. This has a recess for the anchor-bolt nut and a circular depression on its upper side to accommodate a tubular casing. The design shown in Fig. 11 is most frequently used, because one pattern of this design can be used in combination with anchor bolts of several different diameters. However, with the casting shown in Fig. 12, the dimensions of the nut recess and of the casing depression should be different for each size bolt. Hence, it does not pay to make a pattern for a casting like that of Fig. 12 unless many bolts of the same diameter are to be installed.

In constructing a concrete foundation where pocket castings are to be used, the castings can be suspended from the template and held in place by the castings and anchor bolts as shown in Fig. 13. The template thus serves to locate the pockets and also the bolts. The casings, if cut to proper length, will maintain the pocket castings at the correct elevation, and they need only be steadied when the concrete is poured.

Rack for Raising Crossbar on Vaulting Standards

Placing the crossbar upon the vaulting standards consumes considerable

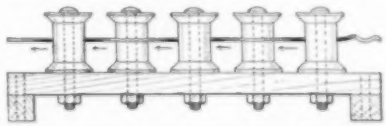


Place the Crossbar on the Rack and Raise It into Place Quickly and Accurately

time and frequently causes annoyance to participants and officials at track meets. This is particularly true in pole vaulting at a considerable height. The device shown in the sketch was made to overcome this difficulty. The crossbar is placed between the projecting strips and raised into place easily. This also insures accurate placing of the bar on the standards, and prevents the possibility of the bar falling accidentally and ruining a trial which might have been successful.—A. B. Wegener, Madison, N. J.

Wire Straightener Made of Spools

An effective wire straightener may be made by bolting several spools to a board in a row, as shown in the illustration. The wire to be straightened is threaded between the spools and drawn through them as indicated by the arrows. This device is very con-

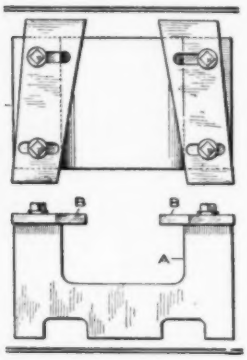


Draw the Wire through the Spools in Order to Straighten It

venient when coils are to be wound, as it will keep wire taut without putting undue strain on it.—Thomas W. Benson, Hastings upon Hudson, N. Y.

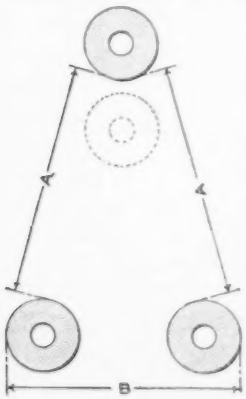
An Adjustable Taper Gauge

The taper gauge illustrated was designed to fit a large variety of taper work. The body A is a casting of gray iron, machined on the upper surface. The adjustable jaws B are made of machine steel, and should have at least one face and the inner edge machined. They may be made of various widths and ranges of adjustment, to suit the work. The jaws are clamped securely by means of the machine screws, which should be of standard-size head, to fit a socket wrench. A convenient size is that used on lathes in the shop where the gauge is to be used.—C. Anderson, Worcester, Mass.



Testing Judgment of Short Distances

Mechanics often pride themselves on their ability to judge and to compare distances accurately. An interesting test of this ability is shown in the illustration. The test is as follows: Arrange three coins, washers, or similar disks in triangular form so that the distances A are equal to the distance B. Almost invariably the third washer, at the apex of the triangle, will be placed in a position as indicated by the dotted outline. Even after the washers have been placed correctly by measurement, the distances A appear to be longer than the distance B.

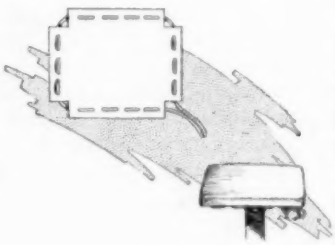


Handle for Cellar or Floor Doors

Doors of the old-fashioned slanting cellar type are quickly pulled out of shape or loosened at the hinges when raised by means of a small handle. If a block is nailed to the door at each end of the edge at which it opens, and a strip nailed across the blocks, the handle may be grasped at any convenient point, and the strain will be distributed over the door properly, with a minimum of damage to it. This type of handle is useful on trapdoors leading down into a cellar, or on doors leading up from a stairway into lofts and attics.

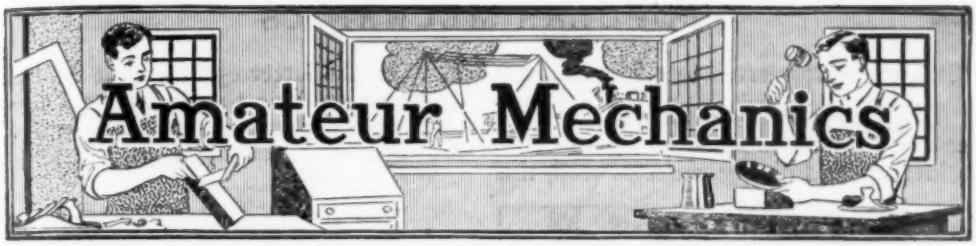
Leather Cover for an Automobile Pedal

An extremely useful attachment for one's automobile is a form of leather boot to cover the pedal pads. The pads, or boots, can be readily made from a piece of thin leather cut to the shape shown, and are held in position by a leather thong. The pad will be found very useful in cold and snowy weather in keeping the foot on the pedal.



Electric Light Warms Carburetor in Winter

A certain, cheap, and convenient way of starting a motor car, which has saved me much annoyance the past winter, is to use an incandescent lamp with an extension cord to warm the carburetor. An old carbon lamp of eight candlepower was used, by simply putting the lamp under the carburetor and in the morning turning on the current from the house about ten minutes before the car is needed.—E. P. Feate, Spokane, Wash.



Steam-Propelled Motorcycle Made by Mechanic

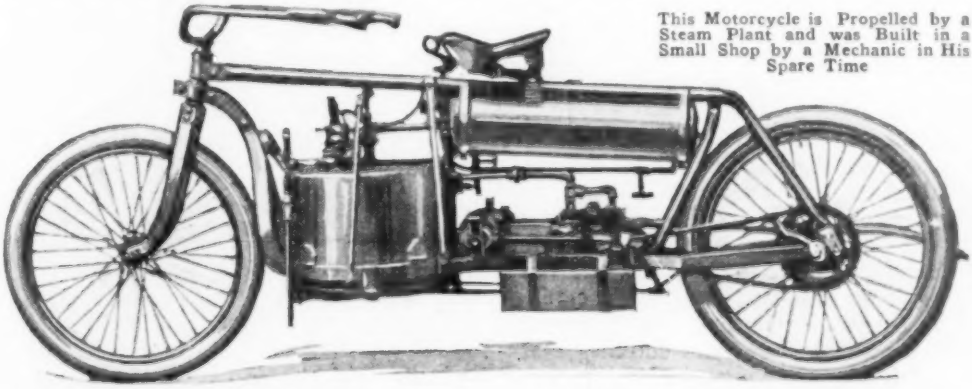
By L. L. VOELEHERT

AS an example of the application of steam power to the propulsion of a vehicle, the motorcycle shown in the illustration is interesting. While it does not embody the many refinements of gasoline motorcycles manufactured commercially, and makes no pretense of competing with them, the machine has a striking individuality. It was made by a mechanic in his spare time, with only the facilities of a small machine shop. Tests and hard usage over typical roads have shown it to be easy riding, partly by reason of its weight, and to give very steady power. The machine can be reversed quickly and no clutch is used. It has a wheel base of 75 in., and weighs about 350 pounds.

The upper portions of the frame are made of 1-in. steel tubing, strongly riveted at the fork and other joints. The lower section, from the fork to the rear axle, is made of a double bar of 1½ by ½-in. steel, spread and braced to carry the tank, engine, and boiler. The fork is forged from strips of steel, and fitted to standard motorcycle wheels. The handlebars, seat, transmission chains and gears, as well as other fittings, are of the ordinary motorcycle type. The seat may be moved and clamped at various places along the upper bar of the frame, and an extra seat may be installed, or a bundle carrier may be fitted behind the driver.

Gasoline, with which to heat water for the generation of steam, is carried in the long round tank, hung below the frame at the top. The water supply is contained in the square flat tank under the lower part of the frame. The engine is supported on the frame immediately above the water tank, and drives a shaft, which is geared to the rear wheel by a chain and sprocket.

The round boiler, with gasoline burners beneath it, is carried on the lower part of the frame, which is spread, immediately behind the front wheel. The boiler is 16 in. in diameter and 12 in. high. It is fitted with valves, whistle, water gauge, and the usual fittings of a boiler. The engine is of the horizontal type, and the working parts are largely inclosed, so as to protect them from dust and to avoid possible danger to the operator.



This Motorcycle is Propelled by a Steam Plant and was Built in a Small Shop by a Mechanic in His Spare Time

Sideboard Converted into Kitchenette

Living in rooms, in which it was necessary to use the small living room as a kitchen and dining room as well, the storage of the cooking equipment became a problem. It was unsightly in the room when not in use, and there was no convenient place in which to store it out of sight. The kitchenette, shown in the sketch, was made from an old sideboard, and served the purpose admirably, being useful also for other needs.

An Old Sideboard was Converted into a Useful Kitchenette, Which Economizes Space

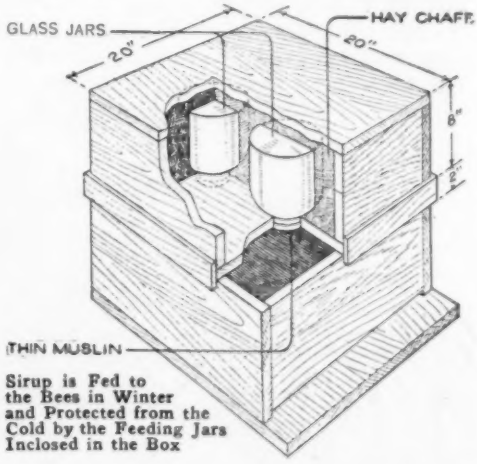
The top was removed and hinged to one end, the supports being removable, for storing them in the cabinet. The hinged top provided a support for the dishes while cooking. The partition between the top drawers was removed and the fronts of the drawers fastened in place with screws. The space thus made available was lined with asbestos, and a small gas stove was fitted into it. The gas line was connected to the stove and two pieces of asbestos sheeting were hinged to fold under the cover and to be leaned against the wall as a protection while cooking. The top could be hinged at the back to protect the wall, or cut in two and the parts hinged one at each end of the cabinet. The lower drawers of the kitchenette were fitted to hold the cooking materials and equipment.

When the kitchenette is closed it is useful as a stand or table, for dining, or for other purposes, including ironing. In the latter operation, it is often desirable to have the hinged top open to give free access around the end of the top.—J. S. Hagans, Toledo, Ohio.

Bee Feeder for Winter Use

The use of a feeder, like that shown in the sketch, makes the feeding of bees in winter convenient. Sirup is fed to the bees from inverted glass jars, the openings of which are covered with muslin, the jars being incased in a packing of chaff in a wooden covering. The wooden box is made to fit over the hive, as shown in the sketch, and a 2-in. strip is nailed over the joint.

The device is made as follows: Use wood smoothed on both sides; pine, basswood, or other soft wood being satisfactory. Make two pieces, 7/8 in. thick, and the same size as the top of the hive. Into one of these cut two round holes, as shown, to fit the necks of the jars. Make two pieces, 6¾ in. wide, for the sides, and two for the ends, the length being suited to the hive, the dimensions given in the sketch being suggestive only. Make four strips, 2 in. wide, and long enough to fit the four sides of the box. Nail the pieces of the box together, as shown, nailing the sides over the end



Sirup is Fed to the Bees in Winter and Protected from the Cold by the Feeding Jars Inclosed in the Box

pieces, and the top over the frame of sides and ends. Pack chaff into the box, and, after filling the jars with sirup and covering their openings with

muslin, pack the jars into the box so that their openings will be level with the bottom through which the holes have been cut. Fasten the board, with holes for the jars, into place with screws, so that it may be removed when it is desired to remove the jars for refilling. Nail the 2-in. strips around the lower edge of the box so as to cover the joint between the box and the hive. The feeder is then fitted into place, the bees feeding from the surface of the muslin. The chaff prevents the sirup from congealing in cold weather and so it is always available for the bees. The use of this simple device will prove economical and practical in keeping bees over the winter, assuring them a good food supply, with little effort on the part of the keeper.—Gus Hansen, Peachland, B. C., Can.

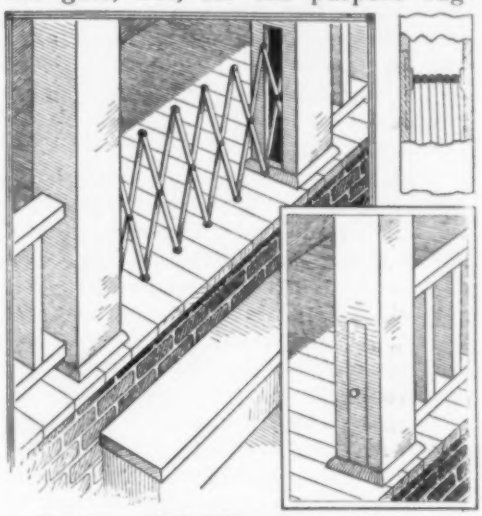
Kink for Driving Nails

Nails, or spikes, may be driven into hard wood without causing them to buckle by applying a coating of vaseline, beeswax, and rosin, mixed in equal portions. A convenient method of applying the mixture is to bore a hole in the end of the hammer handle and fill it with the material. The nails may be pressed into the hole to coat them.—O. Root, Lorain, Ohio.

Porch Gate Folds into Hollow Pillar

The porch is a convenient play spot for the children, but must be properly safeguarded to prevent not uncommon accidents and injury by falls. The folding gate shown in the sketch provides a substantial barrier to the head of the stairs, and may be quickly folded out of the way. It is hardly noticeable when set in the side of the pillar, and does not mar the finish or general effect of the latter.

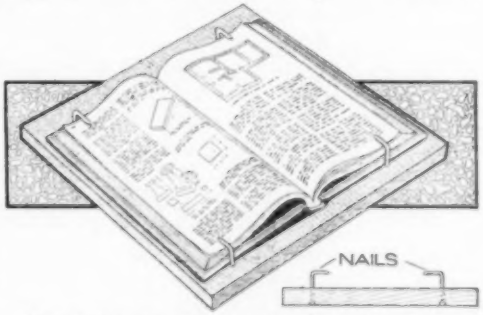
The gate is made of strips of band iron, although wood may be used. The strips are fastened with bolts, or rivets, and the forward end is fitted to the section of the pillar, which forms the cover for the recess in which the gate is housed. The cover is hooked to the opposite pillar when the gate is opened. Any suitable height may be chosen for the gate, but, for the purpose suggested, 24 to 30 in. is satisfactory. The device may be adapted to a variety of other uses by providing a box or chamber for the collapsed gate, when no hollow recess is otherwise available.



The Gate is Folded When Not in Use and is Concealed in the Hollow Porch Pillar

A Homemade Book Holder

A piece of board and four finishing nails furnished me with the necessary materials to construct a book-holding apparatus when in a hurry. Each nail, being driven through the board, could be turned to release, and pulled out far enough to accommodate a thicker book. In fact the device was adjustable.



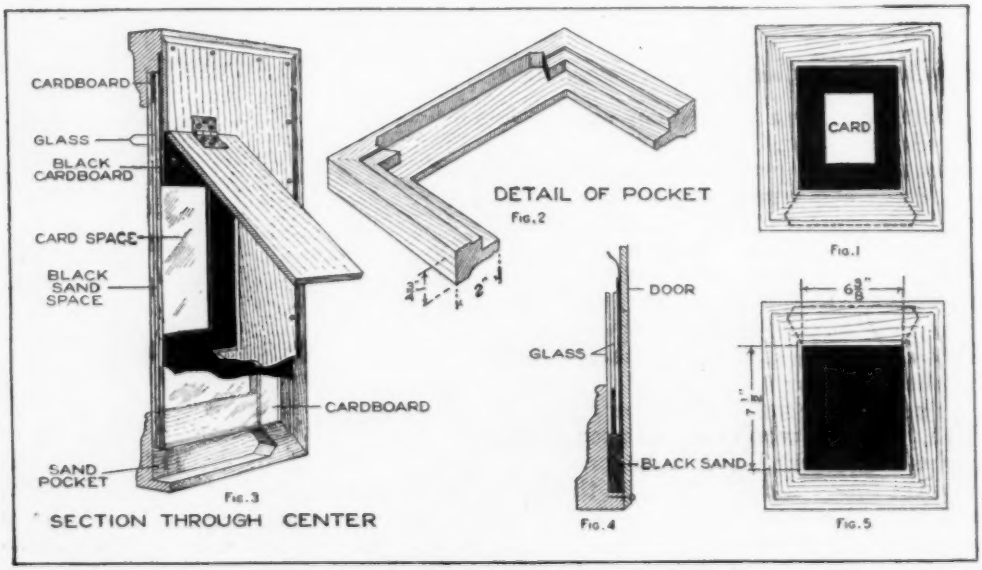
Nails Driven in a Board and Bent in the Shape of Screw Hooks to Hold a Book

The Enchanted Card Frame

A mystifying card trick, in which the performer makes use of the enchanted card frame shown in detail in the illustration, is as follows: A pack of playing cards is given to one of the spectators, who selects a card, noting the number and suit. The card is then placed in an envelope and burned by the spectator. The performer takes the ashes and loads them into a pistol, which he aims at a small frame, shown as empty, and set upon a table a few feet distant. The frame is covered with a handkerchief, and the pistol is fired at the frame. On removing the handkerchief the selected and destroyed card appears in the frame, from which it is taken at the back.

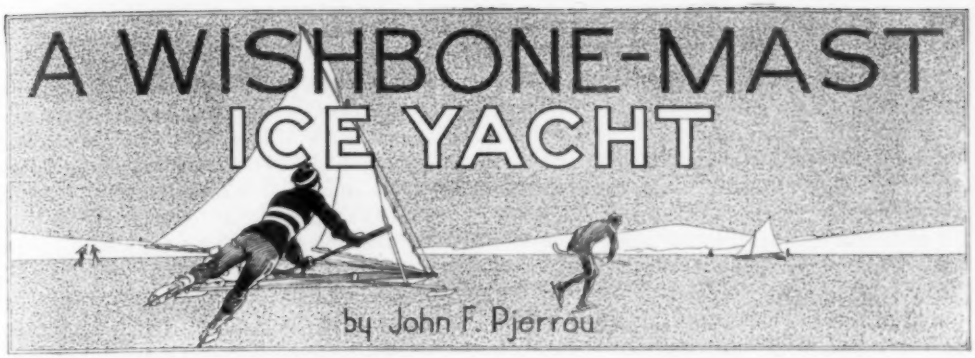
The trick is performed as follows: A forced deck is prepared having 24 like cards, and the backs of the cards are held to the spectators when a card is selected. The frame is made of a molding 2 in. wide, mitered at the corners, and of the size indicated, the opening being 6⅜ by 7½ in. The general views of the frame in normal position and inverted are shown in Figs. 1 and 5. A pocket is cut in the lower edge of the frame at the back, as shown in detail in Fig. 2. A pane of glass is fitted into the frame, and on the three edges other than the one having a pocket, strips of cardboard, ⅛ in. thick, are glued, as a bearing for a second piece of glass, as shown in Fig 4. The back of the frame is fitted with a cover of thin wood, and a hinged door is arranged in the center of the back, as shown in Fig. 3.

A mat of black cardboard is fitted into the frame to form a background behind the card, Fig. 1. The pocket at the bottom is filled with black sand—that used by sign painters is satisfactory—and the frame is ready to receive the card for the performance of the trick. One of the cards from the forced deck is placed in the frame. By inverting the latter the sand is caused to run between the glass partitions, concealing the card on the black mat behind it. In this condition it is exhibited to the spectators and then placed upon the table. A handkerchief is thrown over it. The pistol is one of the toy variety and a cap is fired in it. In picking up the frame the performer turns it over, while removing the handkerchief, so that the black sand runs back into the pocket in the frame.
—Harry Marcelle, Honolulu, H. I.



A Pocket is Cut into the Frame, and Filled with Black Sand, Obscuring the Card When the Frame is Inverted

A WISHBONE-MAST ICE YACHT



by John F. Pjerrou

LARGE spread of canvas and great speed when running with the wind, or "free"; stability under heavy wind, and adaptability to sailing under conditions similar to those of the common, single-boom-and-sheet ice boat, are the features of the ice yacht shown in the illustration. The runner and frame structure is in general typical of ice-boat construction. The double, or wishbone, mast is distinctive, as is the double-boom and sail arrangement, shown in Figs. 1 and 6. The booms are pivoted at the bow of the craft, and controlled at the stern by the usual line and pulley rigging. The booms may be spread so that a V-shaped cavity is afforded for taking the wind when running free, or they may be brought together and both sails manipulated as a single sheet. Reefing and lowering of the sails are accomplished in the usual manner. The framework is very substantial and the proportions are of moderate range, so that the craft may be constructed economically for one or two passengers. The double-boom feature may be omitted if the craft is to be used where little or no opportunity is afforded for running before the wind, by reason of the particular ice areas available. For the experimenter with sailing craft, the wishbone-mast ice yacht affords opportunity for adaptation of the various elements of the craft described, and is a novelty. The dimensions given are for a small yacht, and care must be taken, in adapting the design, to maintain proper proportions for stability and safety. A side view with working dimensions is shown in Fig. 1; inset into it is Fig. 6, showing a front view of the mast and sail arrangement. Figure 2 shows a view of the framework from below. A detail of the fastening of the backbone and runner plank is shown in Fig. 3; a detail of the fastening of the masts and the forward runners into the runner plank, in Fig. 4, and the fixture by which the booms and the yard are attached to the forward end of the backbone, in Fig. 5.

The construction should begin with the making of the lower framework, as shown in Fig. 2 viewed from the lower side. The main frame consists of a backbone, of spruce or white pine, 4 in. thick, 8 in. high at the center, and 16 ft. long, clamped accurately at right angles to a runner plank, of the same material, 2 in. thick, 10 in. wide, and 12 ft. 6 in. long. The backbone is tapered from the middle portion, 5 ft. 6 in. from the forward end, and with a ridge, 8 in. high and 2 ft. 6 in. long, measured from the end of the taper at this end, as shown in Fig. 1. It is tapered to 4 in. at each end, and the bow end is fitted with a three-eye metal ring, as shown in detail in Fig. 5. The runner plank and the backbone are clamped together firmly at their crossing, the backbone being set upon the plank, by means of two strap bolts, with washers and nuts, as shown in detail in Fig. 3. Only the best material should be used in the backbone and runner plank, and the stock should be straight-grained, to give the greatest strength.

The runner plank is tapered down to 8 in. at its ends, to which the guides for the forward runners are fixed. The guides are of straight-grained oak, 1½ by 3 by 14 in., bolted to the runner plank with 5/16-in. carriage bolts, as

shown in the detail sketch, Fig. 4, and in Fig. 2. The guides and the ends of the plank are reinforced with oak chocks, bolted in place at each of the tapered edges of the plank. The forward runners are of oak, 1½ by 5 by 36 in., shaped at their ends as shown, and shod with half-round strap iron. The heads of the screws used for this purpose are countersunk carefully. The runners are pivoted on ⅝-in. bolts, the nuts being set to the inner side. Washers and jam nuts should be provided, or the ends of the bolts riveted slightly, to prevent the nuts from becoming loosened.

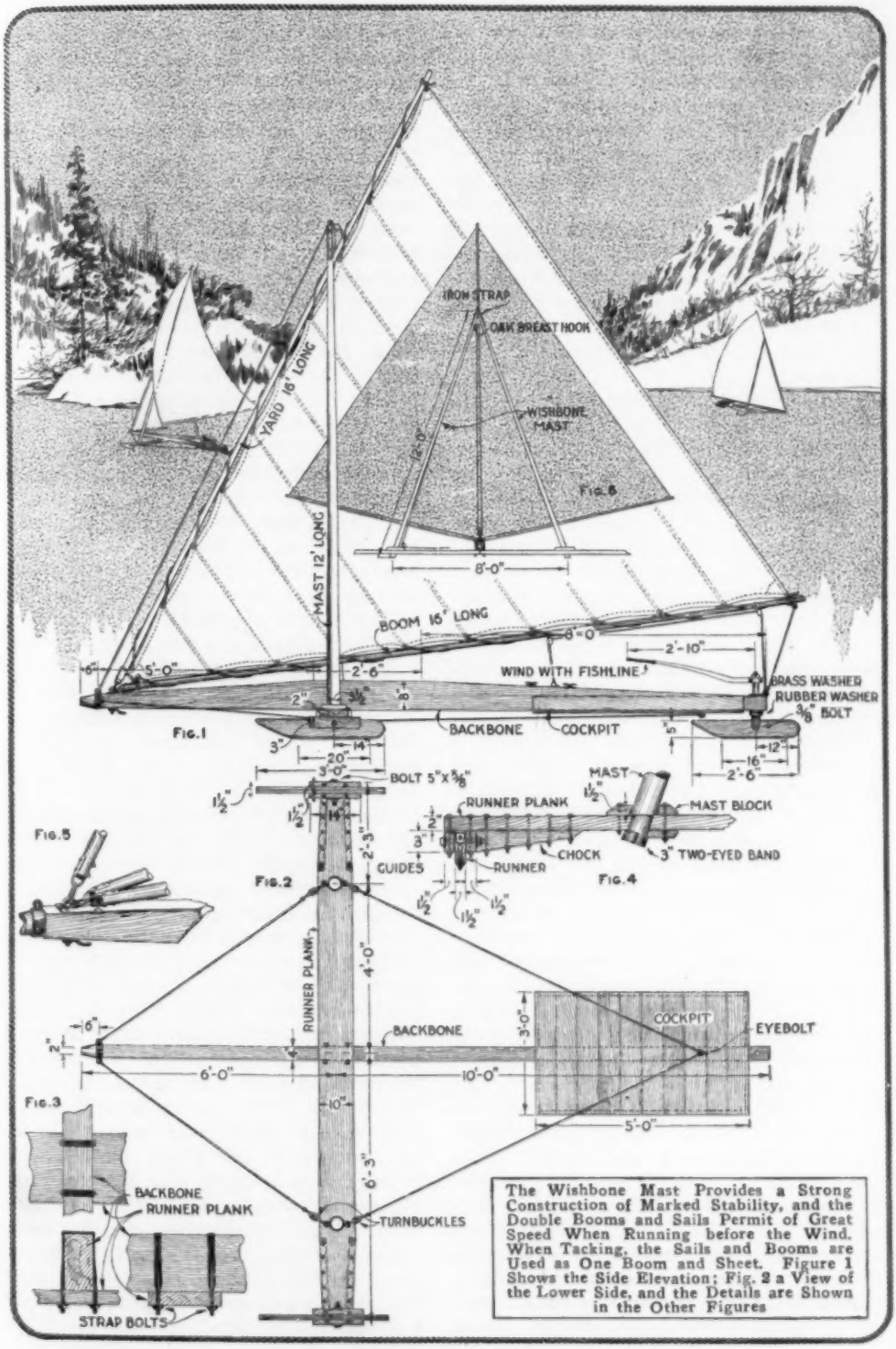
The stern runner is of oak, 1½ by 5 by 30 in., shod like the forward runners, and is pivoted in a forged wrought-iron hanger. The lower portion of the hanger may be made of a strip of heavy iron, bent into a U-shape, and drilled to receive a ⅜-in. bolt, on which the runner pivots. The U-shaped piece is riveted firmly to a vertical shaft, provided with a heavy rubber washer, protected from wear by a metal one, as indicated at the right in Fig. 1. The upper end of the shaft is threaded to receive a washer and nut. A section of pipe is fitted over the shaft, and the steering handle, fitted to a square section of the shaft, is clamped securely.

The cockpit is fixed to the lower side of the backbone, and is 5 ft. long and 3 ft. wide, with coaming, 4 in. high. It is shown with square corners, since this construction is convenient, though not as good as the type having the ends of the cockpit rounded, and fitted with coaming steamed and bent to the curve. The floor of the cockpit is fastened to the backbone with lag screws, and the coaming is also fastened securely; this construction, if carefully made, will afford ample strength. If desired, especially in larger craft, ribs may be fixed to the backbone, to carry the cockpit.

The runners, the runner plank, and the backbone must be alined carefully, so that they are at right angles, and track properly; otherwise the craft will not keep a true course, and cannot be controlled properly by the rudder runner. The backbone and runner plank are held rigidly by four ¼-in. wire-rope stays, shown in Fig. 2. They are fixed to eyes on the bands at the bow, near the ends of the runner plank, and to an eyebolt below the cockpit. The stays are provided with turnbuckles, so that they may be adjusted as required. The bands near the ends of the runner plank are fixed to the lower ends of the masts, as shown in detail in Fig. 4, and are reinforced with oak blocks. The ends of the guy wires are fastened to the eyes by looping them and clamping the resulting eye with steel clamps made for this purpose. Metal thimbles may be fitted into the loop of the rope, to make a better finish; other fastenings may easily be devised by one skilled enough to make such a construction.

The wishbone mast is made of two poles of hickory or ash, 3½ in. thick at the base, and tapered to 2 in. at the top. The poles are joined carefully at the masthead, bolted together, and fitted to an oak breast hook, as shown in Fig. 6. An iron strap reinforces the joint, and an eye, fashioned at its upper end, affords a point of attachment for the forward stay of the mast. The lower ends of the poles forming the mast are fitted into sockets in the runner plank, which is reinforced with mast blocks, as shown in Fig. 4. The ends of the mast, projecting beyond the lower side of the runner plank, are fitted with eye bands, used in guying the runner plank and backbone.

The sails are carried on a yard and two booms, of the same material as the masts, each 16 ft. long, 2¾ in. at the middle and tapering to 1½ in. at the ends. They are fitted with metal rings at the ends to prevent splitting. The yard and booms are fitted to the backbone at the bow by means of loops bolted to them and engaging an eyebolt and ring on the backbone. The eyebolt is fitted into a slotted plate of 3/16-in. sheet iron, and fastened by a lever nut, as shown in Fig. 5. The sheets are fastened to the yard and booms in the usual manner, being fitted with grommets, and tied with line. The yard is suspended from the masthead by means of a line and pulley, the



The Wishbone Mast Provides a Strong Construction of Marked Stability, and the Double Booms and Sails Permit of Great Speed When Running before the Wind. When Tacking, the Sails and Booms are Used as One Boom and Sheet. Figure 1 Shows the Side Elevation; Fig. 2 a View of the Lower Side, and the Details are Shown in the Other Figures

former being cleated to the backbone. The booms are controlled by the operator from the cockpit, by the use of lines and pulleys, similar to the arrangement used on sailboats, except that a duplicate set is required for the additional boom. The lines are cleated on the backbone convenient to the cockpit.

The sails are of the lateen type, and should be made of 8-oz. unbleached cotton duck. The breadths are sewn together by lapping one edge over the other about 1 in., and sewing or stitching along the edge. Yard-wide material is satisfactory, and if narrower laps or bights are desired, simply fold over 1 in. of the goods and double-stitch the seam. The bights should run parallel with the after, or leach, edge of the sail, as shown in Fig. 1. Each corner of the sail should be reinforced with a triangular patch of duck, so that it will stand up under the severe strain of winter usage. The edges of the sail may be bound with ¼-in. tarred rope, which is not difficult if a sailor's palm and a diamond-pointed needle are used. Sail twine, well waxed, should be used for the sewing of the sails.

The edges of the sails adjoining the yard and booms are provided with grommet holes by means of which the sails are attached to their supports. The grommets are made by punching holes in the sails, at the proper points, fitting two ¾-in. brass grommet rings into the holes, one at each side, and overcasting them with a buttonhole stitch. The sail needle and waxed sail twine are used. The reef points are of the usual type, and are made of ⅛-in. cotton rope, whipped at the ends to prevent raveling, and sewed to the sails at intervals.

The craft is designed to be taken down when not in use, particularly between seasons, and can be stored in comparatively small space, in the knockdown form. The method of setting up the ice yacht will serve to illustrate, also, the method of taking it down, in that the process is practically reversed. First, the backbone is fitted with the forward ring and the strap bolts are fastened at the crossing of the backbone and runner plank. The runners are fitted into place, and the steering rigging is adjusted. The wishbone mast is set into its steps, clamped at its masthead, and the bands fitted to the lower ends. The guy wires at the bottom and that at the masthead are then set, by means of the turnbuckles. The sails are attached to the yard and booms, and the forward end of the latter supports are fixed into place. The pulley at the masthead is fitted with ⅜-in. rope which is fastened to the yard, at the proper point, as indicated in Fig. 1. The rigging by which the booms are controlled is threaded through the pulleys at the stern and the ends fixed on the cleats. The yard may now be hauled up and the craft trimmed so that the sails "set" properly. The halyard is fixed to the yard, as shown, and run through a pulley at the masthead, then down through a second pulley fixed to the runner plank, from which it is conducted to cleats convenient to the operator in the cockpit.

The main sheets are rigged as shown in Fig. 1. The ends of the lines are lashed to the ends of the booms, passed through pulleys, at the stern of the backbone, on the booms, about 1 ft. from the ends, and 5 ft. from the ends, respectively, then down to the cleats at the cockpit. This rigging gives good purchase on the lines and makes it convenient for the operator to attend to the helm and the lines at the same time. The fittings are, as nearly as possible, designed to be standard and may be purchased from ship chandlers, or dealers in marine hardware and fittings. The special metal parts may be made by one of fair mechanical skill, or may be made by local blacksmiths. The woodwork is all comparatively simple. The masts, yard, and booms should be smoothed carefully, sandpapered lightly, and finished with several coats of spar varnish. The other woodwork may be painted suitably, and the metal fittings should be finished with two coats of red lead, or other good paint for use on metals exposed to the weather.

The manipulation of this craft is in general similar to that of the common lateen-rig, or other sail and ice, boats. When running before the wind—free—the booms are separated and the wind acts against the sails in the pocket between them. When tacking, the booms are brought together, and the sails act as one sheet, on a craft of the ordinary type.

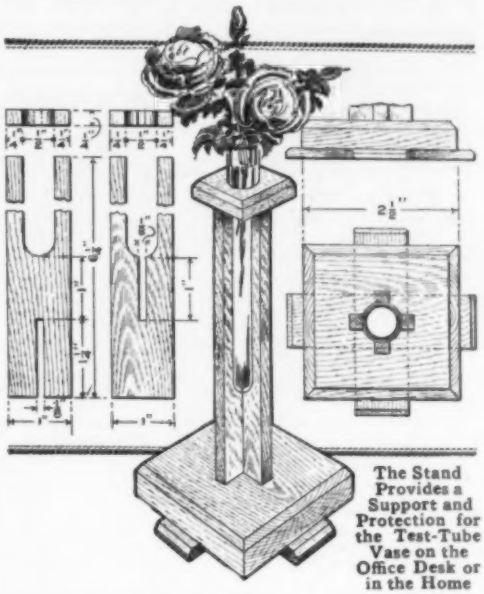
Cork Plugs Save Wear on Drafting Board

Draftsmen, whose work demands the use of drawing paper of uniform size, sometimes experience difficulty in fixing thumb tacks solidly in the board. This is caused by the continual placing of tacks in the same spot and may be overcome by the use of cork plugs which can be removed when worn. At the four points where the tacks are generally placed, bore 1-in. holes nearly through the board. Insert corks large enough to be forced into the holes and trim them off flush with the surface. Tacks will hold firmly in them and new corks may be inserted as needed. —G. F. Thompson, Pittsburgh, Pa.

Stand for a Test-Tube Flower Vase

A test-tube vase, containing a single blossom, adds color and a certain individual touch to the business man's desk, or it may be used with effectiveness in the home. A simple wooden stand, finished to harmonize with the surroundings, may be made easily, and affords a support and protection for the test tube. The sketch shows a small stand of this type, made of oak, in the straight-line mission style. It may be adapted to other woods and to various designs in straight or curved lines.

The base is 2½ in. square, and rests on two cross strips, 1 in. wide. All the material may be about ¼ in. thick, but it is desirable to have the base and cap pieces of thicker stuff. The uprights may be of ⅛ to ¼-in. stuff, and are notched together as shown. They are 1 in. wide and 6¼ in. long, a portion being cut out to receive the test tube. The cap is 1½ in. square, and its edges are chamfered slightly, as are those on the upper edge of the base. The pieces



The Stand Provides a Support and Protection for the Test-Tube Vase on the Office Desk or in the Home

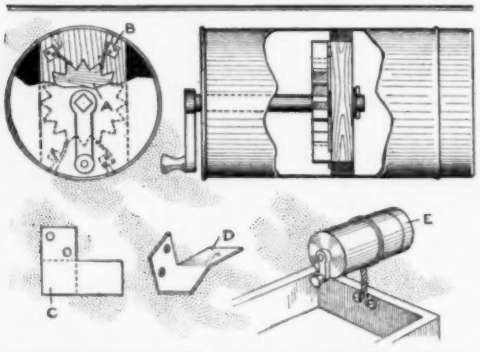
are fitted together with small brads, used as hidden dowels, and the joints are glued. Brads may be used to nail the pieces together, and they should be sunk into the wood, and the resulting holes filled carefully. The stand should be stained a dark color, or left natural, and given a coat of shellac or varnish.

Pouring Liquids Quickly from Containers

In pouring a liquid from a jug or bottle, the vessel should be held with the opening downward, rather than horizontally, if convenient, and swung quickly with a circular motion. The liquid will rotate and in leaving the opening will permit air to enter continuously, causing the liquid to run out rapidly and without intermittent gurgling sounds. If the opening of the container is at one side it is best to hold the container so that the opening is at the highest point of the end rather than at the bottom. The air may thus enter and permit a continuous flow until the container is empty.—E. F. Koke, Colorado Springs, Colo.

Auto Horn for Child's Play Vehicle

A baking-powder, or other tinned, can may be used to make the small automobile horn shown in the illustration,



This Small Auto Horn was Made of a Tinned Can Fitted with a Notched Wheel and Pawls

for use on a child's coaster wagon. The device consists of a toothed wheel operating against several metal pawls within the can, and the warning sound is produced by turning a small crank at the end of the can. The can is fixed to the side of the vehicle by means of a wire or strap-iron bracket, as shown in the sketch at E.

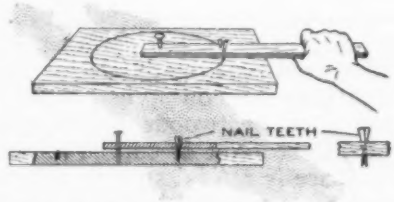
A piece of wood is fitted into the can, to support the ratchet wheel. It is bored to carry a shaft, which bears in the end of the can, and at the exposed end of which is fixed a crank. A disk of wood, about ½ in. thick, is cut to have a notched edge, as shown at A. The notched wheel is placed upon the shaft, and fastened securely to it, so that the ratchet wheel revolves with the shaft when the crank on the latter is turned. Four small pawls of sheet metal, are fixed on the inner support, as shown at B. They are made by cutting pieces of metal to the shape shown at C, and folding them, as shown at D. They are fastened to the support with small screws or nails. The cover is placed on the end of the can when the device is used. The action of the ratchet wheel against the pawls is to produce a loud grating sound, resembling that of a horn of the siren type.—William Freebury, Buffalo, N. Y.

Wall Pocket for Paste Tubes

A small paste tube of the collapsible variety is hard to keep at hand on the desk and occasionally, if left uncovered, the contents may be forced out on papers or on the table. A simple container may be made for the tube by cutting the carton in which the tube is packed with a penknife, so as to expose the upper end of the tube. The cover and upper end of the back of the carton is doubled over to provide an extra thickness for a support, by which the contrivance may be suspended on the wall.—T. H. Linthicum, Annapolis, Md.

Cutting Thin Wooden Disks

Instead of cutting thin wooden disks with a coping saw, making it necessary to smooth off the circumference of the disk, more satisfactory results may be had by the following method: Determine the center from which the circumference of the disk is to be struck. Drive a nail through a strip of wood, about 1 in. wide and ¼ in. thick, and into the center of the proposed disk. At a point on the strip, so as to strike the circumference of the disk, drive two sharp brads, as shown in the sectional view of the sketch, arranging them to act as saw teeth, by driving them at an angle, with a slight space between the points. By grasping the end of the strip and drawing it carefully around the center a number of



Draw the Strip with Its Saw-Tooth Brads around the Center, Cutting Out the Disk

times, the disk may be cut cleanly. By cutting from one side nearly through the board, and then finishing the cut from the other, an especially good job results.—S. E. Woods, Seattle, Wash.

Woven Reed Furniture

By CHARLES M. MILLER

A Variety of Small Stools and Foot Rests

[The various materials referred to in this article by number or size were described in detail in an article on "A Reed Basket," in the April 1915, magazine, page 625.—Editor.]

FOOTSTOOLS of reed are preferable, in the home, to those made of other materials, because of their light weight, rounded edges, and comfortable, yielding tops. Reed, rattan, and similar material, used in their construction, withstand hard wear, and will not easily mar floors or furniture, a feature not to be overlooked, especially since the footstool is a favorite seat or play table of children. Several types of stools and foot rests are shown in the illustration. A stool having a framework of dowels, covered with reed, and utilizing the frame to produce a paneled effect, is shown in Fig. 3. The upper dowel of the framework is covered and woven over with the top, in the somewhat lighter stool shown in Fig. 8; the legs are braced at the ends with reed, arched and covered with winding reed. The stool shown in Fig. 11 is designed with rounded lines, the bracing dowels being set low, and a panel of openwork woven into the sides. Figure 15 shows a foot rest, the framework of which is steamed and bent, and the top slanted to provide a more comfortable rest for the feet. It is strongly braced, paneled on the sides with winding reed, and ornamented with openwork scrolls. The details of the construction of the frames and the method of weaving the reed are shown in the other sketches.

Dowels, ¾ in. in diameter, are used for the main framework of all of the stools shown. The dimensions of the various stools may be made to suit individual taste, those suggested in each instance having been found satisfactory. A good size for the stool shown in Fig. 3 is: height, 9 in.; width, 11 in.; length, 15 in. The lower of the horizontal dowels should be set at least one-third the height of the leg from the top. The braces are notched at their ends to fit the curve of the legs, and finishing nails are driven into them through the legs. The corner joints are further reinforced by a binding of reed, placed over them. The holes for the spokes are bored through the braces before the construction is nailed together. They should be bored about 1¼ in. apart, spaced uniformly, according to the length and width of the stool. The tops of the legs should project about 1/16 in. above the upper braces, so as to produce a level surface when the winding reed is applied.

The upper end of the legs must first be covered with winding reed, as shown in Fig. 2. Tack a strip of the reed on; then add successive pieces, as shown, until the end is covered. The joint of the leg and the lower brace must be reinforced, as shown in Fig. 2, by tacking winding reed over it horizontally. The braces must then be wound with winding reed, the spokes being inserted later. In winding the reed on the braces, tack one end of it to the brace at the left of a leg; then begin the winding on the brace to the right of the leg, and as each hole is encountered mark with pencil on the reed, so that if any of the holes are covered

they may be found easily, when inserting the spokes. The marks should be made on the lower side.

The spokes extend from the lower edge of the bottom rail on one side to the lower edge of the corresponding rail or brace on the opposite side. Short spokes are fitted between the upper and lower rails at the ends of the stool. The top is woven complete before the sides are woven, the pairing weave being used. In this method two strands of reed are handled together, the first passing behind one spoke, and being below the second strand, and then passing in front of the next spoke, and being above the second strand, etc. This weave is shown in detail in Fig. 9, illustrating an article on "Taborets and Small Tables for the Summer Veranda," page 155, July, 1916. The weaving of the top includes the covering of the upper rails at the ends of the stool, which are wound in as spokes, the reed passing around them and being directed back in the opposite direction.

The weaving for the sides is carried around the stool continuously, passing around the legs. One of the strands in the pairing weave passes behind the leg, and the other must be wound around it an extra turn, to cover up the space otherwise exposed. The reed is wound around the legs to the lower end, the strand being tacked at the inner side of the leg.

The framework for the second type of stool is shown in Fig. 6. The two side rails are fixed into place by the same method used in making the first stool, and the frame is braced on the ends by sections of No. 12 or No. 14 reed. These are fitted into place and covered in the winding. The braces should be fitted to the curve of the leg, and nailed into place with small finishing nails. The ends where the braces join the legs and rails should be whittled down to a long, thin wedge, so that they may be bound in securely by the reed that is wound around the legs, as shown in Fig. 4.

The spokes in this model, as shown in Fig. 6, do not pass through the upper rails, but extend from one lower rail over the upper rails and to the lower rail on the opposite side. This makes it necessary that the upper rails be set slightly below and in from the top and outer edges of the legs. The lower rails should then be set in so as to be uniform with the upper ones.

The lower rails and the end braces are wound by the method used for the rails in the first stool. The tops of the legs are finished differently, however, as shown in Figs. 4 and 5. The weaving is begun at the lower rail, and proceeds until the side panel is filled to the under edge of the upper rail. The weavers cannot then be returned at the corner, and are cut off to extend 2 in. beyond the leg. Their ends are thinned out, and then brought around the corner against the upper rail on the end, as shown in Fig. 5. Alternately they are turned down on the leg and against the end rail, producing a covering for the corner. The strands of the top are woven over the thinned-out ends, and bound over the joint of the braces with the upper rail. The corners may be beaten gently with a block of wood to smooth them, and to bring the weavers firmly together. The weavers pass twice around the legs, as each strand is brought to the leg, as shown in Figs. 5 and 7. It will be found convenient to place the spokes in only one lower rail, as in Fig. 6, while weaving the first side panel, and the top. As the work proceeds the spokes are bound down to the upper end rails, and when the middle of the second side panel is reached, they are trimmed off and fitted into their holes, on that side.

The third stool differs fundamentally from the preceding ones in that the framework is curved at the upper ends, and the weaving of the top is carried down over the ends. The framework is shown in detail, in Fig. 9. Ash dowels, ¾ in. in diameter, are used for the framework, and the rails are notched into the main sections, and nailed, as were those in the preceding stools. The length of the curved dowels must be determined carefully, and it is desirable to have the stock longer than

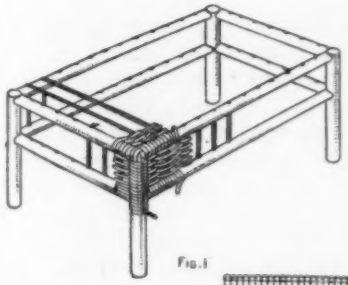


Fig. 1

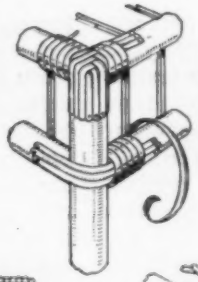


Fig. 2

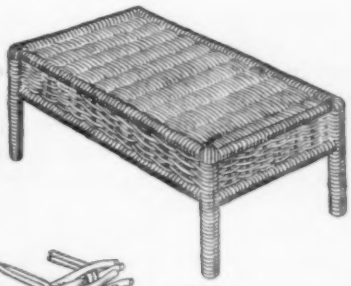


Fig. 3

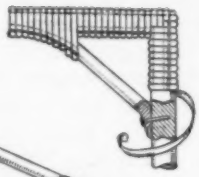


Fig. 4

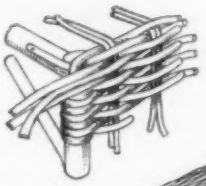


Fig. 5

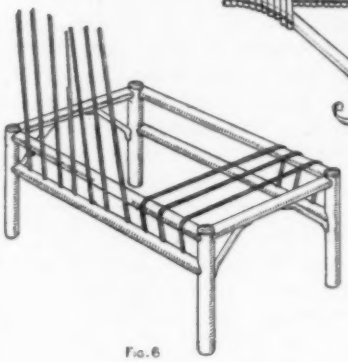


Fig. 6

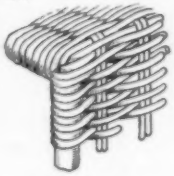


Fig. 7

Fig. 8

Fig. 10

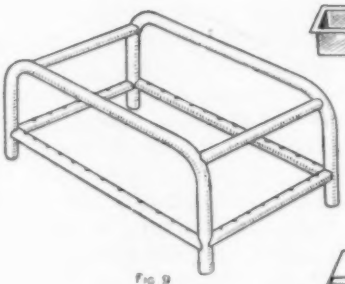


Fig. 9

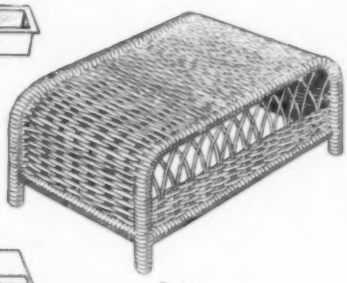


Fig. 11

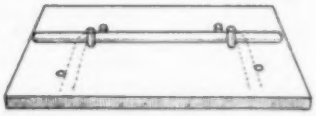


Fig. 12

Fig. 14

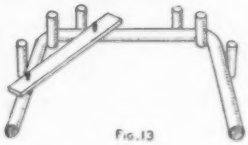


Fig. 13

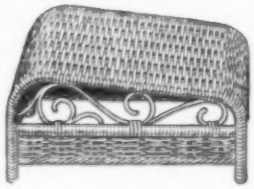


Fig. 15

The Making of Stools in Woven Reed Affords the Craftworker an Excellent Opportunity to Produce Constructions, for Home Use, or as Gifts, That Have Originality and a Personal Element. The Frameworks for Four Typical Stools and Foot Rests are Shown at the Left, and the Completed Objects at the Right. Figure 14 Shows a Variation Adaptable to the Methods of Weaving Shown in Other Models

is necessary for the finished pieces, so that inaccuracies in bending may be allowed for properly. The distance between the legs should be such that a space of ½ in. is provided between the legs and the first hole for the side spokes, and the intervening spokes should be placed 1 in. apart. A satisfactory size is to make the stool 6 in. high, the end rails 8 in., and the side rails 13 inches.

The method of bending the dowels is shown in Figs. 12 and 13. They must be soaked in hot water or steamed, and clamped around the form as indicated, being left to dry. A pipe fitted over the ends of the dowels, to give leverage, will aid in bending them. The form is made by fitting pegs, suitably spaced, into a board, ⅞ in. or more in thickness. The curved pieces may be braced temporarily, as shown, and removed from the form when partly dried, so that it can be used quickly for the second piece. The pegs must be set close enough together so that the curve at the upper ends of the legs will not be too large, making the legs appear short. Care must be taken in bending this short curve, as the dowels are likely to break if the curve is quite abrupt. By setting the pegs solidly and making them long enough, two pieces of dowel rod may be curved in the form at the same time, and permitted to dry. A convenient tray of galvanized iron, for use in heating water for the moistening of the dowels, is shown in Fig. 10. It is 28 in. long, but may be made shorter if the points at which curves are to be made are moistened separately. A wash boiler, or any other suitable vessel, may be used for heating the water and dipping the dowels into it. After being shaped, the pieces are trimmed off to the proper height on the leg portions. Holes for the spokes are then bored through the lower and side rails, and they are notched and nailed to the legs.

The cross rails of the framework, shown in Fig. 9, are fixed into place by the method used in the previous models. The lower rails should be set about 2 in. from the floor, and are bored for double spokes. The rails are set with their outer edges ⅛ in. in from the edges of the legs, so that the weaving will be flush with the surface of the legs, rather than project slightly beyond it. The spokes for the ends and seat, or top, pass from one lower rail on one end to the corresponding rail on the other end, and are supported on the upper end rails. There are no corners to be fitted with the winding reed in this model, as the windings continue over the curves at the ends and down over the latter, by the same method of weaving as used in the top. The weaving is begun at the lower rails, and passes completely around the sides and ends of the stool, until about 1½ in. has been covered, up from the lower rails. The ends only are then covered, the strands of reed passing around the curved portion of the upper rails, and around the dowels forming the support for the top, in weaving back and forth.

The ornamental weaving at the sides of the stool is produced by spreading out the double spokes and conducting them to the proper holes in the upper rails. Several types of design may be made by crossing the spokes in various ways before setting them into the holes in the rails. The short spokes in the sides are permitted to remain with their upper ends free and longer than necessary while the 1½-in. lower section is woven. They must be cut carefully to the size necessary to form the desired design, and the ends glued into the holes.

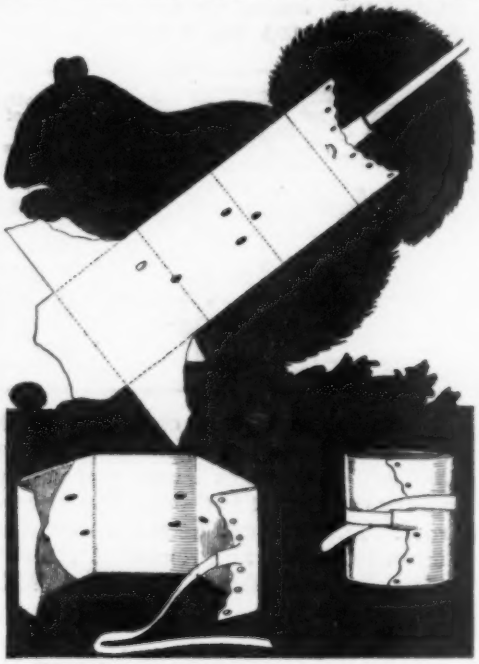
The stool shown in Fig. 15 is designed as a foot rest, with a slanting top. It is similar in general construction to that shown in Figs. 9 and 11, the framework being made of dowels, bent to the shape indicated by means of a form. The top and ends are woven in the manner described for the previous model. A point of difference to be noted is the bracing by means of a woven panel below the side rails, as shown in Fig. 15. This feature may be carried around the ends also, or the ends may be braced to the lower side panel by the method of bracing shown

in Fig. 4. The rails around the stool are all on the same level. The double spokes for the top are fixed into the end rails, the spokes for the side panels into the side rails, and the smaller dowel placed at the lower edge of the side panels, as a support for the twisted weaving shown. The weaving of the top and the panels is by the method used in the previous model. The scrolls fitted into the open portions of the sides are tacked into place, and the strands of weaving reed carried over them, where the curves touch the upper and lower rails. A variety of designs may be worked out for the openwork. The scrolls are made of No. 6 or No. 8 reed, and should be formed on a base, as in Fig. 12, brads being used to hold them in shape until dry.

Another type of foot rest with a slanting top is shown in Fig. 14. The framework is built up of dowels, straight sections only being used. The joints are fastened by the method used in the first and second models described. The method of covering the frame is essentially the same as for the stool shown in Fig. 15, or an adaptation of that used in Fig. 11 may also be applied. Where facilities for steaming or moistening the dowels are not to be had conveniently, this type of construction will be found satisfactory, the designs being limited to straight lines, however. The method of covering the framework used in Fig. 3 is also available for the framework shown in Fig. 14, and the corners may be finished as shown in Fig. 2. Numerous variations and combinations of the types shown may be worked out readily after one has become reasonably familiar with the possibilities of woven-reed construction.

Squirrel-Skin Bill Fold

As a souvenir of the "days afield" my brother fashioned a quaint bill fold out of a squirrel skin, which, by the way, is a skin of remarkable toughness. After tanning the skin and removing the hair, it was cut as shown, the skin of the forelegs being used as fold-overs. The piece of tape took the place of the tail. The shot holes through the skin



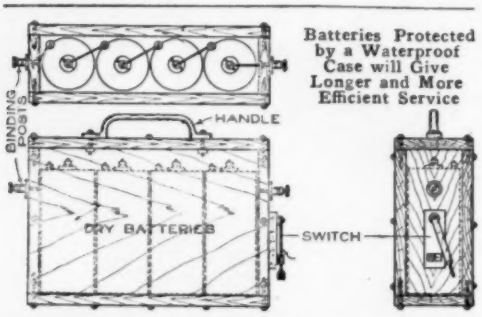
Bill Fold Fashioned from a Squirrel Skin as a Souvenir of a Hunting Trip

added the requisite touch of realism, recalling a day with the gun.—James M. Kane, Doylestown, Pa.

Waterproof Dry-Battery Case

Dry batteries that are sealed in a tight, waterproof case will last much longer than those exposed to dampness, especially in marine practice. A box, like that shown in the sketch, will afford excellent protection and add materially to the life and efficiency of batteries. It is constructed of ½-in. cypress, or oak, of a length and width depending upon the capacity in number of cells desired. The inside dimensions should be such that the cells are firmly fitted. It should be put together with screws and marine, or any other waterproof, glue. The batteries should be placed in the case and connected. Molten paraffin wax should then be poured over and under the cells. Do not get the wax too hot, but heated only to the melting point. Bind-

ing posts and a single-blade switch should be placed on the case and connected up. Screw on the cover, after painting the top edges with the glue.



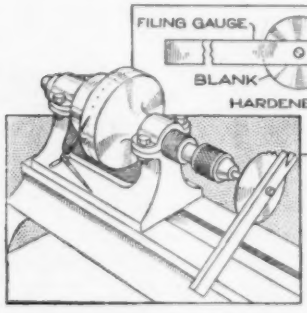
Batteries Protected by a Waterproof Case will Give Longer and More Efficient Service

Give the case a good coat of varnish and paint, and fit with a carrying handle. This makes a neat and handy battery outfit that is thoroughly waterproof. The case can be refilled by cutting out the wax and removing the old cells.—B. F. Dashiell, Baltimore, Md.

Making Small Ratchet Wheels in a Lathe

Accurately formed ratchet wheels of small size may be made without special appliances in a lathe. A triangular file and a simple gauge, made of a piece of hardened steel, are the only tools required, as shown in the illustration.

The lathe is prepared as an index for the ratchet wheels by dividing the face of one of the steps, preferably the largest, of the cone pulley. A center punch may be used in marking the graduations slightly, and another point should be marked in the headstock base, from which dividers are used to gauge the movement of the spindle. The dividers should be set, when the work is begun, so that one point rests in the punch mark on the headstock and the other in one of the marks on the pulley. The bearings should be tightened so that the work will not shift easily. The blank to be cut is supported on an arbor provided with a shoulder, and is held in place by a small machine screw, threaded into the end of the arbor.



Ratchet Wheels may be Cut Accurately with a File, Using a Hardened-Steel Gauge as a Guide

The teeth are cut by filing them with the gauge as a guide. If the spindle is turned carefully so that the dividers register the graduations precisely, the ratchet wheel will be cut accurately. By first roughing out the teeth and then refiling them with a fine file, a more smoothly finished surface will result. Other forms of teeth might also be made if a properly shaped gauge is provided.—Charles F. Merrill, Hopedale, Mass.

Front-Opening Hatbox

Lifting a hatbox down from a high shelf, only to find that the desired hat is not among the several hats contained therein, is annoying. If the hat shelves of the clothes closet are provided with boxes that open on the front, the hats may be removed easily without taking the boxes from the shelves. Rectangular boxes are used for making the front-opening containers by cutting the side corners of the front, and using the front lower edge as a hinge. The top, or cover, is placed over the box, holding the hinged front in place when closed. These boxes have been found to afford ample protection and are convenient.—D. J. Hough, Toledo, Ohio.

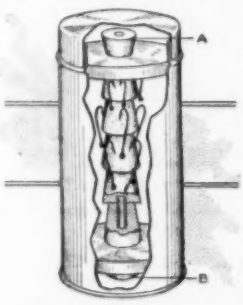
Plaster of Paris to Set Screws into Wall

Screws holding light fittings in a bathroom were found to be driven into the plaster between laths and became loosened. No strain was placed upon them, and as it was desired to replace the screws in the same holes, the fol-

lowing method was employed: A cotton string was wrapped around the threads of the screw, and the screw then dipped into plaster of Paris until sufficient of this adhered to it to fill the hole in the wall and to permit some of it to be forced behind the plaster. When the plugs thus formed were dry, they resisted a considerable pressure, by reason of the enlarged portions behind the plaster.—H. A. Trester, Milwaukee, Wis.

Case for Fishhooks Made of a Tin Can

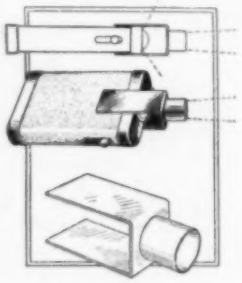
After trying several devices for keeping my fishhooks, I hit upon my present method, which has been found satisfactory. The materials used are: a ½-lb. baking-powder tin; two disks, 2 in. in diameter and ¼ in. thick, sawed from a convenient limb; a twig, 4 in. long, somewhat smaller than a lead pencil, made smooth and straight; enough cork stoppers, about ¾ in. in diameter at the small end, to make 3½ in. in length, and a few drops of cold glue.



Drill a hole lengthwise through the stoppers and through the center of each disk, just large enough to allow the twig to pass through closely. Cut from the small ends of two of the stoppers a piece, ¼ in. long, for pieces A and B. Pass the twig through the long stoppers and the disks; the pieces A and B should then be glued to the ends of the twigs projecting beyond the disks, to fasten the hook holder together, and to be used for handles by which it may be lifted from the box. If the hooks are dry when they are stuck into the corks which form the center, they will keep in good condition indefinitely, and their points will never be dulled by coming in contact with the tin sides of the box or with each other.—C. A. King, East Kingston, N. H.

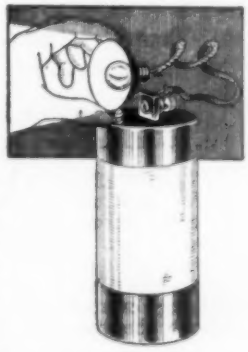
Improvement on Pocket Flash Lamps

It is often desirable to concentrate the rays from a pocket flash lamp on a limited area rather than spreading them, as is the case with many lamps of this type. The addition of a hood, which may be slipped over the lens, as shown in the illustration, concentrates the light in this manner. A strip of sheet brass, about 1/32 in. thick, 4 in. long, and ¾ in. wide, was drilled at the center, forming an opening of the same diameter as the lens. A brass tube was soldered to fit over the hole. The ends of the strip were bent back at right angles, to hold the device firmly against the sides of the flash lamp. The lamp is used in the ordinary fashion, and the clip may be removed quickly when not needed. It may be plated or finished to suit the metal parts of the lamp.—Ralph W. Tillotson, Erie, Pa.

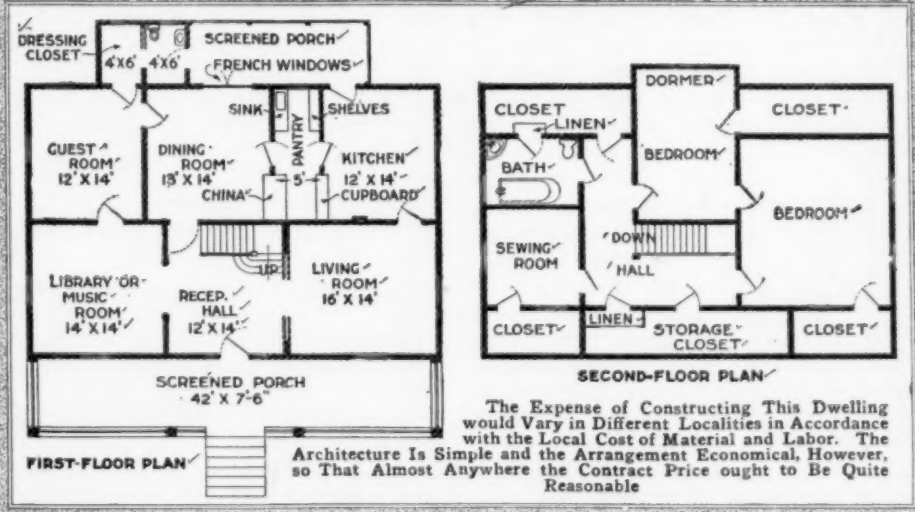


Testing Dry Cells with Light Bulb

Tests of batteries for telephones, doorbells, and similar appliances, may be made by the use of a lamp from a pocket flash light. Remove the reflector and lamp and connect them with the poles of each cell to be tested, as shown in the sketch. The glow of the lamp is proportional to the amount of life in the cell. Very often but one dead cell will be found to cause trouble. By testing carefully, the good cells may be retained and new ones substituted for those worn out.



SUBURBAN HOUSE OF HOSPITABLE APPEARANCE



The Expense of Constructing This Dwelling would Vary in Different Localities in Accordance with the Local Cost of Material and Labor. The Architecture Is Simple and the Arrangement Economical, However, so That Almost Anywhere the Contract Price ought to Be Quite Reasonable

PRESENTED here is a suggestion for a suburban house, of inviting appearance and comfortable arrangement, suited for the average needs of a small family in moderate circumstances. There is a great abundance of closet room and also liberal shelf and cupboard space in the pantry. The broad front porch, screened in, offers an ideal living room for the summer months, while a spacious outdoor sleeping parlor, with toilet and dressing compartment connected, is a feature of intimate appeal to those who have tired of limitations of city apartments and long for air and sunlight, as well as adequate room. It will be noticed that the arrangement of the library, reception hall, and living room is such that the three can be thrown into one spacious apartment when entertaining is being done. The house is of frame construction.

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